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Smith

THE ANNALS  
AND  
MAGAZINE OF NATURAL HISTORY,

INCLUDING  
ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND  
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY  
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,  
ARTHUR E. SHIPLEY, M.A., Sc.D., F.R.S., F.Z.S.,  
AND  
WILLIAM FRANCIS, F.L.S.

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VOL. XIX.—EIGHTH SERIES.  
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LONDON:  
PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.  
SOLD BY SIMPKIN, MARSHALL, HAMILTON, KENT, AND CO., LD.;  
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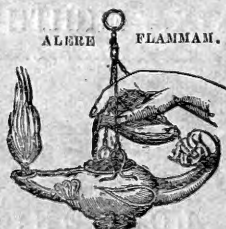
1917.

"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstinata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

..... The sylvan powers  
 Obey our summons; from their deepest dells  
 The Dryads come, and throw their garlands wild  
 And odorous branches at our feet; the Nymphs  
 That press with nimble step the mountain-thyme  
 And purple heath-flower come not empty-handed,  
 But scatter round ten thousand forms minute  
 Of velvet moss or lichen, torn from rock  
 Or rifted oak or cavern deep: the Naiads too  
 Quit their loved native stream, from whose smooth face  
 They crop the lily, and each sedge and rush  
 That drinks the rippling tide: the frozen poles,  
 Where peril waits the bold adventurer's tread,  
 The burning sands of Borneo and Cayenne,  
 All, all to us unlock their secret stores  
 And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.



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ERRATUM.

Page 330, line 14, for 1913. *Talitriator*, Matthews, P. Z. S. Lond. p. 109,  
read *Talitriator*, Methuen, P. Z. S. Lond. p. 109.



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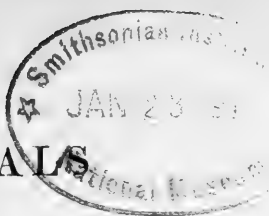
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"..... per litora spargite musoum,  
Naiades, et circum vitreos considite fontes:  
Pollice virgineo teneros hic carpite flores:  
Floribus et pictum, divæ, replete canistrum.  
At vos, o Nymphæ Craterides, ite sub undas;  
Ite, recurvato variata corallia trunco  
Vellite muscosis e rupibus, et mihi conchas  
Ferte, Deæ pelagi, et pingui conchyliis ancco."  
N. Parthenii Giannettasi, Eol. 1.

---

No. 109. JANUARY 1917.

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I.—Corylophidæ [*Coleoptera*] from the Seychelles and Rangoon. By HUGH SCOTT, M.A., F.L.S., Curator in Entomology in the University of Cambridge.

[Plates I.-V.]

THE main purpose of this paper is to give an account of the Corylophid beetles obtained by the Percy Sladen Trust Expedition of 1905 and 1908-9 in the Seychelles and other islands of the Western Indian Ocean. But I have also included certain forms taken at Rangoon in 1911. The actual sources of these two sets of material may be considered separately, as follows:—

(A) RANGOON.—The specimens were collected from a nest of *Munia striata*, a bird belonging to the Ploceidæ or weaver-birds, on Oct. 9th, 1911, by Dr. H. H. Marshall, M.O.H., and sent by him in alcohol to Professor G. H. F. Nuttall at the Quick Laboratory, Cambridge. Professor Nuttall kindly handed over the Coleoptera to me. They consist of three species of Corylophidæ—namely, *Arthrolips flavicollis*, Matthews, *Orthoperus munia*, sp. n., and *Orthoperus* sp. indet., as well as a single example of an undetermined

Cucujid which seems closely allied to *Silvanus longicornis*, Grouvelle, a form known from Singapore. In addition to Coleoptera, the tube contained some Lepidopterous larvæ, a spider (*Scytodes* sp.), and some Gammasid mites, all from the same bird's-nest. I do not know of other recorded cases of Corylophidæ being found in birds'-nests, but I have myself taken a specimen of *Orthoperus* from a blackbird's or thrush's nest of the preceding year at Henley-on-Thames, 25. iii. 1910.

(B) SEYCHELLES ISLANDS.—It was intended that all results of the Percy Sladen Trust Expedition should appear together in one publication, but circumstances have rendered this impossible. The work in question consists of certain special volumes of Trans. Linn. Soc. London, five of which are already complete (ser. 2, Zool., vols. xii.—xvi.), while a sixth is in progress: these contain, *inter alia*, a number of reports on insects. In the present paper much the same plan is followed as in my two previous articles on certain groups of Seychelles Coleoptera (*op. cit.* vol. xv. p. 215, 1912; vol. xvi. p. 193, 1913).

No Corylophidæ have been recorded from these islands before. Those dealt with here amount to twelve species, ten of which are described as new (see below, under "*determination of species*"), while one is undetermined and one is referred to a previously described species. They belong to eight genera, one of which is described as new. The series may be briefly analyzed thus:—*Sacium*, 4 spp. n.; *Arthroliptis*, 1 sp. n., 1 sp. indet.; *Meioderus*, 1 sp. n.; *Sericoderus* (*Anisomeristes*), 1 sp. n.; *Daubania*, g. n., 1 sp. n.; *Lewisium*, 1 sp. n.; *Rhyphobius*, 1 sp. n.; *Orthoperus*, 1 sp. (previously known).

*Distribution*.—One species, *Rhyphobius aquilinus*, was found only on a coralline island of the Amirantes Group. The other eleven were all taken by the writer in the mountainous granitic islands of the Seychelles proper. Six of these were found exclusively in the island of Silhouette, which was visited only during the drier months of August and September; one was only obtained in Long Island, a small cultivated islet near Mahé, in July, also one of the drier months; the remaining four, including the new genus *Daubania*, were taken in two or more of the larger islands, and in both the drier and wetter seasons.

Two species are represented by single specimens, two (*Sericoderus* and *Lewisium*) by big series of over 50 and of nearly 200 respectively, the remainder by series of from 3 to 15 examples. They were all preserved dry.

Seven kinds were obtained only at high elevations, in the

endemic forests; one (*Arthrolips insulæ-longæ*), as stated above, only on a cultivated islet. Of the remainder, *Daubania* (gen. nov.) occurred in the high forests and at more moderate elevations, while the two most abundant forms (*Sericoderus* and *Lewisium*) seemed generally distributed from the cultivated country up into the endemic woods at high altitudes.

Most of the material was collected somewhat promiscuously, by general sweeping and beating of vegetation, but in some cases I have exact records of the manner in which specimens were taken. Thus some of the *Sericoderus* and of the *Lewisium* were swept from long grass, and most of the *Sacium picaultianum* were beaten from dead palm-leaves, a very fruitful source of beetle-life. Two individuals of the *Lewisium* were found in a fallen branch containing an ant's nest (see p. 24), though whether their presence was accidental or intentional I cannot say.

*Affinities.*—The world-fauna of creatures so minute as Corylophidæ must be at present but very imperfectly known, therefore it is not profitable to discuss at length the affinities of the Seychelles series. Moreover, having regard to the highly peculiar nature of the endemic vegetation, and to the large number of peculiar insects and other animals existing there, it is probable that some at least of the species herein described will prove to be absolutely confined to these islands. But such indications of affinities as exist may be briefly considered for what they are worth.

The only form referred to a previously described species is *Orthoperus minutissimus*, Matth., hitherto recorded from S. America and W. Indies. The new genus *Daubania* is allied to *Oligarthrum*, known only from S. America, and to *Corylophus*, widely distributed in Europe and Asia. *Meioderus* was previously recorded only from Japan, *Lewisium* from Ceylon and Japan. The other genera are known from all parts of the world.

The Corylophid fauna of Madagascar appears to be very little known. The only species included in Alluaud's 'Liste des Insectes Coléoptères de la Région Malgache' \* (p. 105) is *Sacium monstrosum* (Schaufuss) †, which, from its description, seems quite unlike any of the Seychelles forms. Matthews describes his *Sacium bifasciatum* (Mon. p. 54) from Madagascar, and this is a little like my *Sacium picaultianum*. I have found no further records of Corylophidæ

\* Vol. xxi. of Grandidier's 'Histoire Physique, Naturelle, et Politique de Madagascar,' Paris, 1900.

† = *Clypeaster monstrosus*, Schaufuss, Tijdschr. Ent. xxxiv. 1891, p. 2; Matthews, Mon. Corylophidæ, p. 217.



from Madagascar in the subsequent literature. Reitter's (1908) descriptions of E. African species have been studied, but without seeing specimens it is hard to pronounce on their relationships with those of the Seychelles. In comparing the latter with forms in Matthews's collection, I have several times found that the nearest to the Seychelles species are Oriental forms, from Ceylon, Japan, &c. (*cf.* the distribution of the genera *Meioderus* and *Lewisium*, mentioned above), but the resemblance is not generally very close. However, if these apparent indications of Oriental affinities should prove genuine, this would only tally with what has been found so strongly marked in certain other groups of Seychelles insects.

On the whole, the Seychellean forms are *very minute, even for Corylophidæ*. In comparing, I have been repeatedly struck with their small size in relation to their congeners.

STRUCTURE.—Various anatomical points are dealt with under the headings of particular genera and species. Thus *secondary sexual characters* have come to light in *Rhypobius* and *Orthoperus*, and differential specific characters in the form of *antennæ* and *mouth-parts* in certain species of *Sacium*, *Sericoderus*, and *Lewisium*—in *Sacium* also in the form of the *prosternum*. Attention is called to the presence of diverging metasternal striæ in *Orthoperus*.

The *condition of the hind wings* is stated, so far as it has been examined, in the case of each particular species. I follow Matthews in using the term "ample" to denote that the wings are not reduced, vestigial, or absent, but much longer than the elytra, under which they are folded. It appears that they are ample in ten out of the fifteen species dealt with below, the remaining five being:—*Arthrolips* sp. indet., wings present but could not be examined; *Arthrolips flavicollis*, Matth., *Orthoperus minutissimus*, Matth., and *Orthoperus* sp. indet., wings not examined; *Rhypobius aquilinus*, sp. n., wings present and longer than the elytra in the ♂, but seemingly quite absent in the ♀. This last case is interesting, exhibiting a sexual difference in the wing-development. The genus *Rhypobius* (= *Moronillus*) is said by Ganglbauer (Käf. Mitteleur. iii. pp. 273, 283-4) to have the hind wings quite absent. Matthews makes the less general statement (Mon. pp. 172-3) that these organs are absent in the "genotype," *R. marinus*, Leconte, but says nothing of their condition in the other species. In a pair of the European *R. ruficollis* (Duval) which I have examined I find no trace of hind wings in either sex. I have not investigated their condition in other species of the genus.

Matthews also states (Mon. pp. 109, 115) that the hind wings are either absent or small and narrow in *Sericoderus* and *Anisomeristes*, but in those specimens of *S. (A.) seychellensis*, sp. n., which I have dissected they are much longer than the elytra. For the rest Matthews describes them as "ample" in his diagnoses of all the other genera except six, in which he either states that he had not examined them or does not mention them at all. But in the case of some genera examination of larger numbers both of species and individuals is probably required.

**TECHNIQUE.**—In fixing the generic position of species I have never relied on general appearance alone, but have in all cases made balsam-preparations of antennæ and mouth-parts for examination under the compound microscope. These preparations are mounted between two cover-slips, one of which is attached to a cardboard framework; the thinness of the glass then allows of both sides of the object being viewed through a high-power objective, while the cardboard framework admits of the preparations being pinned beside the insects. Balsam-preparations appear almost essential in dealing with Corylophidæ, and are indispensable in describing any new genus.

*Measurements* of length have been made with a calibrated micrometer-eyepiece. *Drawings* made with the aid of a drawing-apparatus.

For comparison I have used the British Museum Collection, which, including Matthews's Collection and his balsam-preparations, is fairly complete up to the date of his 'Monograph' (1899). Descriptions of older forms not included in the Monograph, and of all species and genera described since, have been consulted.

**LITERATURE.**—Matthews's 'Monograph of Corylophidæ and Sphæriidæ' appeared in 1899, after its author's decease. A number of species unknown to him were not included in his manuscript, but the editor of the Monograph refers to these on pp. 19–21 and p. 217. The Monograph may therefore be taken as a fairly complete enumeration of the species up to and including 1899.

The following is a list of the subsequent literature, compiled from the 'Zoological Record,' the nature of each work being briefly indicated. Though a catalogue of the family has recently appeared, this list may also be of some use:—

1900. CASEY. Journ. New York Ent. Soc. viii. pp. 60–75, review of N. Amer. forms, describing several new genera and species: *Bathona*, g. n., *Gronevus*, g. n., *Eutrilia*, g. n. near *Orthoperus*, *Molamba*, g. n. near *Sacium*.

1900. DODERO. Ann. Mus. Genova, xl. p. 565, records *Sacium formosum*, Matth., from Burmah.
- REITTER. Wien. ent. Zeit. xix. p. 132, synonymic notes; Deutsch. ent. Zeitschr. p. 82, describes *Sericoderus chobauti*, sp. n., from S. France [see 1908].
1901. REITTER. Deutsch. ent. Zeitschr. p. 70, *Orthoperus acariformis*, sp. n., from West Turkestan.
1902. REITTER. Wien. ent. Zeit. xxi. p. 137, *Orthoperus schneideri*, sp. n., from Corsica.
1903. FAUVEL. Rev. Ent. Franc. (Caen), xxii. pp. 289-291, three new species of *Arthrolips* and one of *Corylophus* from New Caledonia\*.
- MORRILL. Ent. News (Philadelphia), xiv. pp. 135-138, pl. vi., metamorphosis of *Corylophodes marginicollis*.
1903. REITTER. Wien. ent. Zeit. xxvii. pp. 59-63, describes a number of forms from E. Africa (*Homogrypinus*, g. n. near *Sericoderus*, and new species of *Sacium*, *Arthrolips*, *Sericoderus*, *Corylophus*, and *Orthoperus*); t. c. p. 198, synonymic notes, and sinks *Sericoderus chobauti*, Reitt. (1900), as a var. of *S. reuellieri*, Reitt.
- SCOTT. 'Fauna Hawaiensis,' iii. pp. 415-8, includes description of *Sacium angusticolle*, sp. n. [omitted by Csiki from his Catalogue, 1910].
1909. REITTER. Bull. Soc. ent. Egypte, i. (1908) p. 40, descr. *Sericoderus (Anisomeristes) pecirkanus*, sp. n., from Egypt.
1910. BLATCHLEY. Bull. Indiana Dept. Geol. i. pp. 501-506, describes Indiana species.
- CSIKI. Rovart. Lapok. xvii. p. 28, synonymic notes and new names; Coleopt. Catalog. (Junk & Schenkling), part 18, pp. 5-28, catalogue of the family.
1912. SHARP and MUIR. Tr. Ent. Soc. London, p. 507, ♂ genital armature.
1913. HETSCHKO. Wien. ent. Zeit. xxxii. p. 181, *Matthewsiella*, nom. nov. for *Microum*.
- REITTER. Deutsche ent. Zeitschr. pp. 653-4, *Sericoderistes*, gen. nov. near *Sericoderus*, with a new species, from Turkestan.
- SAHLBERG. Öfv. Finsk. Vetensk.-Soc. Förh. (Helsingfors), vol. lv. 1912-13, Afd. A, no. 8, p. 12, *Catoptyx levantinus*, sp. n., Lebanon.
1914. BROWN. New Zealand Institute, Bull. 1, part 3, p. 173, *Sacina curtula*, sp. n., New Zealand.

In the following portion of this paper dates in brackets after authors' names refer to the above list.

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\* In this paper Fauvel also records (p. 289) *Arthrolips souverbiei* (Montr.) from New Caledonia. This species was described by Montrousier from that country as one of the Heteromera, being made the type of a new genus *Apelta* (Ann. Soc. Linn. Lyon, vol. xi. 1864, p. 124), and as such it is included in the Munich Catalogue (vol. vii. p. 1972) under Tenebrionidæ. But Fauvel, as stated above, records it as a Corylophid, giving *Apelta* as a synonym of *Arthrolips*. The name *souverbiei* does not, however, appear to be mentioned in Csiki's 'Catalogue of Corylophidæ' (1910) either as a valid species or as a synonym.

**TYPES.**—A first set of the material, including the types of the new genus and of all new species, will be placed in the British Museum; a second set will be retained in the Cambridge University Museum.

**SACIUM, Leconte.**  
(Pl. I. figs. 1-9.)

*Sacium*, Leconte, Proc. Ac. Philad. vi. 1852, p. 142.

The material includes four species from the Seychelles, all quite distinct from each other and from anything in Matthews's collection; neither do the descriptions of the few species which I have not seen correspond at all with any of the Seychelles forms. Reitter (1908) has described five species from East Africa; but after careful study of his descriptions I conclude that none of my species is identical with any of his.

*Structural Characters.*—In examining the Seychelles collection I have noticed certain structural differences between the species, of a kind which does not seem to have been hitherto employed. Thus, among these four species there are two distinct types of *prosternum*: (i.) of appreciable length in front of the coxæ and furnished with an elevated median keel (fig. 6); (ii.) exceedingly short in front of the coxæ and with no keel (fig. 3); further details are given in the specific descriptions. Matthews (Mon. p. 41) writes "*prosterno parvo, inter coxas elevato . . .*," but makes no statement as to specific differences in its form.

Another category of characters is exhibited by the *mouth-parts*. A balsam-preparation was made in order to fix with certainty the generic position of each species. These preparations exhibit slight differences in the form and relative proportions of such parts as the mentum and joints of the palpi, differences which are briefly mentioned in each description (*cf.* figs. 2, 5, 8, 9).

Characters such as these are not necessary for separating the Seychelles species, which are amply distinct in other ways. But they are indicated in case they should prove useful in further studies of this large genus of minute creatures.

1. *Sacium picaultianum*, sp. n.  
(Pl. I. figs. 1-3.)

Oblongo-ovale, supra nitidissimum, fere glabrum; piceo-nigrum, thoracis margine anteriore testaceo, elytris maculis 4 (in utroque

elytro 2) rufo-flavis, corpore subtus rufo-piceo, pedibus rufo-testaceis, antennarum clavis infuscatis; supra tote fortiter dense punctatum, thoracis basi plus minusve regulariter seriatim punctata; metasterno et segmento 1° abdominis subtiliter dense punctatis.

Long. corp. 1.05–1.25 mm.

Oblong-oval, with elytra nearly parallel-sided, not very much broader than the thorax at their widest point; upper surface very shining, with the punctures bearing such excessively short minute hairs (only visible under a compound microscope) that it may almost be called glabrous. *Colour*: thorax pitchy black, with the anterior explanate margin translucent and testaceous, the testaceous colour extending back a little on to the disc in two places, one on either side of the middle line in front; scutellum black; elytra pitchy black, with two reddish-yellow marks on each, the front pair of marks extending from the base to  $\frac{1}{3}$  the length or more, fairly widely separated from the outer margins and at the suture; the hind pair only very narrowly separated at the suture, sometimes quite confluent across it, fairly widely separated from the apex of the elytron, each mark extending obliquely forwards from the suture nearly to the outer margin. In a few examples the spots of the front pair also are nearly confluent across the suture; and in some (possibly immature) the whole elytra are much paler, almost uniform pitchy reddish or even testaceous. Underside reddish pitchy, apex of the abdomen rufescent. Legs reddish testaceous. Clubs of antennæ dark. *Thorax* and *elytra* closely and strongly punctured, the punctures separated by from once to twice their own diameter, the thorax with a basal series of more closely placed punctures (very distinct in the figured specimen, but less regular in others); *elytra* with lateral margins reflexed and visible from directly above throughout the greater part of their length; sutural stria present, obsolete in about the anterior  $\frac{1}{3}$ . *Wings* dissected out and found to be ample. *Metasternum* and *abdomen* finely and closely punctured and finely pubescent; the punctuation more sparse on the postero-median part of the metasternum.

*Prosternum* (Pl. I. fig. 3) extremely short, forming in front of each coxa a bridge so narrow that it can scarcely be seen in looking directly down on to the under surface; there is consequently no room for a median elevated keel in front of the coxæ (contrast *Sacium grossinianum*, fig. 6). A balsam-preparation of the mouth-parts shows that the



*mentum* (fig. 2) is narrow, pointed in front, and the terminal joints of the *labial palpi* slightly longer than the second.

*Sacium picaultianum* approaches three species which I have seen—*S. bifasciatum*, Matth. (Madagascar), *S. quadrimaculatum*, Matth. (Ceylon), and *S. flaviventre*, Matth. (Ceylon), Mon. pp. 53, 54. *S. bifasciatum* is slightly longer in proportion, more tapering behind, much more finely punctured, with the basal thoracic series much less distinct, and the light marks on the elytra less sharply defined and differently arranged. *S. quadrimaculatum* and *S. flaviventre* are both larger and differently shaped in outline, having the elytra less parallel-sided and broadening out rather more behind the shoulders; both have the disc of the thorax dark red instead of pitchy black and the marks on the elytra much smaller; moreover, the upper surface is entirely glabrous, the punctures being devoid of even such minute hairs as are present in *S. picaultianum*. The latter is quite distinct from any of the three.

*Loc.* Seychelles: Silhouette Island, 1908.

Fifteen specimens. Nine were beaten from dead palm-leaves on the Mare aux Cochons plateau, over 1000 feet, 25. ix. 1908; five others are from the same locality, though how obtained is not recorded; and one is from the other side of the island, near Mont Pot-à-eau.

Named after Captain Lazare Picault, who commanded one of the earliest expeditions to the Seychelles, in 1742\*.

## 2. *Sacium grossinianum*, sp. n. (Pl. I. figs. 4-6.)

Oblongo-ovale, supra sat nitidum, subtiliter dense punctatum atque pubescens, picco-nigrum, thoracis margine anteriore late testaceo, elytris fasciis 2 transversis rufo-flavis, in sutura interdum anguste interruptis; metasterno et segmento 1° abdominis nigris, thorace subtus et segmentis posterioribus rufescentibus, pedibus antennisque rufo-flavis, harum clavis haud nigricantibus.  
Long. corp. 1.15 mm.

Oblong-oval, with thorax rather long, its anterior margin forming a curve that narrows considerably in front, and with elytra nearly parallel-sided, but considerably broader than the thorax at their widest point; upper surface fairly shining, covered with fine, short, decumbent, pale pubescence.

\* For this and other historical particulars, see J. Stanley Gardiner, "The Seychelles Archipelago," *Geographical Journal*, Feb. 1907, pp. 148-174.

*Colour*: thorax pitchy black, with front margin rather broadly reddish testaceous; elytra pitchy black, with two broad transverse reddish-yellow fasciæ, the anterior or both of which may be narrowly interrupted by darker colour at the suture, thus almost forming four separate marks; in one example the scutellum is included in the anterior pale fascia, in another it is darker; metasternum and first abdominal segment pitchy black, posterior segments paler; underside of thorax, legs, and antennæ reddish yellow, clubs of the antennæ not black. *Thorax* and *elytra* closely and very finely punctured, the punctures twice their own diameter, or rather more, apart; the thorax has no distinct basal series, but an impressed line immediately before the base; sutural stria present but vanishing in nearly the anterior  $\frac{1}{2}$ ; lateral margins of elytra reflexed through about  $\frac{2}{3}$  the length from the shoulder, visible from directly above. *Wings* apparently ample, but not dissected out. *Metasternum* and *abdomen* finely and closely punctured and pubescent.

*Prøsternum* (Pl. I. fig. 6) much longer than in *Sacium picaultianum*, forming in front of each coxa a bridge about half as broad in an antero-posterior direction as the dimensions of the coxæ in the same direction, and having a sharply elevated median longitudinal keel. A balsam-preparation of the mouth-parts shows that the *mentum* (Pl. I. fig. 5) is broader, not pointed in front, more like Matthews's figure (pl. i. D 6).

Several species resemble this in general scheme of colour, but its pubescent surface distinguishes it in many cases, and I have seen none very closely similar to it. Among the other Seychelles species it is abundantly distinct from *S. picaultianum* by its pubescence, its narrower form, finer punctuation, longer prosternum, by the confluence of the light marks on the elytra to form transverse fasciæ, &c.

*Loc.* Seychelles: Silhouette Island.

Three examples, from the same place as most of the preceding species, the Mare aux Cochons plateau or near by, ix. 1908.

Named in memory of Captain Grossin, a member of Picault's expedition to the Seychelles in 1742.

### 3. *Sacium roslanianum*, sp. n. (Pl. I. figs. 7 & 8.)

Late ovale, supra nitidissimum, tote glabrum, modice sat dense punctatum; piceo-nigrum, margine anteriore thoracis late pallide testaceo, elytro utroque macula singula media rufo-flava, corpore

subtus piceo, pedibus piceis vel fusco-testaceis, antennarum clavis fuscis.

Long. corp. 1.0 mm.

Rather shortly and broadly oval, with thorax forming almost a perfect semicircle (not a narrowing curve), and elytra considerably wider than the thorax, reaching their widest point a little before the middle; shining and entirely glabrous above. *Colour*: pitchy black; front margin of the thorax broadly pale testaceous and translucent; each elytron has a median pale spot, narrowly separated from its neighbour at the suture, more widely separated from the outer margin; in one specimen the spots are clear yellow, in others darker, reddish, and suffused; the black ground-colour is slightly diluted at the apices of the elytra; underside pitchy; legs pitchy or fusco-testaceous, with paler tibiæ; head and clubs of antennæ dark. *Thorax* and *elytra* moderately strongly and closely punctured; lateral margins of elytra reflexed throughout the greater part of their length, visible from directly above; sutural stria present, vanishing in the anterior portion. *Wings* apparently ample, but not dissected out. *Metasternum* and *abdomen* with remote punctures bearing fine short hairs, the former nearly impunctate in the middle.

*Prosternum* in front of each coxa forming a bridge of considerable breadth in an antero-posterior direction, and having an elevated median longitudinal keel, *i. e.* approaching the condition found in *Sacium grossinianum* (cf. fig. 6). The balsam-preparation of the mouth-parts shows that the *mentum* (fig. 8) is rather narrow and bluntly pointed in front, the apical joints of the *labial palpi* shorter than the second (contrast *S. picaultianum*), and the penultimate (third) joints of the *maxillary palpi* proportionately longer than in some other species.

*Sacium concinnum*, Matth. (Ceylon), *S. formosum*, Matth. (Ceylon), and *S. politum*, Matth. (Japan) [Mon. pp. 52, 56, 57], all have the same general scheme of colour—each elytron with a single pale mark on a dark ground. *S. roslanianum* is, however, quite distinct from them all. *S. concinnum* is differently shaped, having the elytra very little wider than the thorax, its punctuation is much closer, and the light marks on the elytra are more longitudinal in direction and much more widely separated from the outer margins and from one another. *S. formosum* is larger, longer, and narrower, with thorax forming a longer narrowing curve; also its thorax is reddish instead of black, and the pale marks lie farther back on the elytra and are much more widely

separated at the suture; the punctuation also is finer. *S. politum* is much larger, proportionately longer, and narrower, with red thorax; its pale marks are much shorter in an antero-posterior direction—*i. e.*, they form a narrow transverse fascia on the elytra.

*Loc.* Seychelles: Silhouette and Mahé, 1908-9.

Five specimens, from the high forests. In Silhouette two were found, near Mont Pot-à-eau (ca. 1500 feet), and at Mare aux Cochons; in Mahé three, from Cascade Estate at about 1000 feet, and from the Mare aux Cochons district at about 1500 feet.

Named after Monsieur du Roslan, under whom an early expedition visited the Seychelles in 1769.

#### 4. *Sacium rochonianum*, sp. n.

(Pl. I. fig. 9.)

Minutum, ovale, supra nitidissimum, glaberrimum, omnino impunctatum; thorace rufo-flavo; elytris piceo-nigris, vel unicoloribus, vel fascia pallida transversa suffusa, plus minusve distincta, munitis; metasterno piceo-nigro, abdomine rufescente, ore antennis pedibus flavis, antennarum clavis haud nigricantibus.

Long. corp. 0.9-1.0 mm.

Minute, oval, the front margin of the thorax forming an elliptical curve narrowing slightly in front, sides of the elytra gradually curved, reaching their widest point a little before the middle; very shining, absolutely impunctate, and glabrous above. *Colour*: thorax unicolorous reddish yellow, rather paler at the front margin; scutellum in most examples reddish yellow, in some darker; elytra pitchy black, diluter at the apices; in some specimens practically unicolorous, but in most there is near the suture just behind the middle a paler area, which, though very indistinct in some, in other cases forms a suffused transverse pale fascia; metasternum pitchy black, underside of thorax yellowish testaceous, of abdomen reddish; head, antennæ, and legs yellow, clubs of the antennæ not darkened. *Elytra* with lateral margins narrowly reflexed throughout most of their length from the shoulder, these margins visible from above immediately behind the shoulder and again in the posterior half, but scarcely visible (or invisible) for a short space just before the middle; sutural stria present, extending forwards a little beyond the middle. *Wings* apparently ample, but not dissected out. *Metasternum* quite smooth, glabrous, and impunctate in the middle, with scanty very short pubescence at the sides; *abdomen* with longer yellowish pubescence.

*Prosternum* formed rather as in *Sacium picaultianum*, very short, forming only a very narrow bridge in front of each coxa, and sloping steeply upwards (*i. e.*, dorsalwards) in the middle in front, not forming a median keel. The balsam-preparation of the mouth-parts shows that the *mentum* (fig. 9) is broader than long (contrast *S. picaultianum*).

No species which I have seen is closely like this. The Hawaiian *S. angusticolle*, Scott (1908, p. 416), resembles it in its minute size and general colour-scheme—red thorax and black elytra. But *S. angusticolle* is distinctly though finely punctured and pubescent above, and is proportionately longer and narrower, less oval in outline, and with elytra less broadened about the middle.

*Loc.* Seychelles: Silhouette, 1908.

Fifteen examples, all from the high endemic forest above Mare aux Cochons, well over 1000 feet.

Named after the Abbé Rochon, a member of du Roslan's expedition in 1769; he left a written record, and his name has been given to a river in Mahé.

#### ARTHROLIPS, Wollaston.

The material includes three species—*A. flavicollis*, Matth., hitherto known from Java, an example of which is now recorded from Rangoon; *A. insulæ-longæ*, sp. n., from the Seychelles; and an undetermined species from the Seychelles. Since the appearance of Matthews's Monograph, Fauvel (1903) has described three new species from New Caledonia, and Reitter (1908) two new species from East Africa. But those before me do not appear to be identical with any of these.

##### 5. *Arthrolips flavicollis*, Matthews.

*Arthrolips flavicollis*, Matthews, Ann. & Mag. Nat. Hist. (5) vol. xix. 1887, p. 107; Mon. Corylophidæ, p. 92.

One example, agreeing closely with the type.

*Loc.* Rangoon; from nest of *Munia striata*, 9. x. 1911 (Dr. H. H. Marshall). Previously recorded from Java.

##### 6. *Arthrolips insulæ-longæ*, sp. n. (Pl. I. figs. 10, 11.)

Sat breviter ovalis, convexus, nitidus, castaneus, fere unicolor, sed elytris ad latera et antice ad suturam indistincte infuscatis, pedibus antennisque castaneis, harum clavis haud nigricantibus; corpore supra subtusque dense punctato, pallide pubescente.  
Long. corp. 1.15–1.25 mm.

Rather shortly oval, more convex than several of its congeners, shining, castaneous, almost unicolorous above and beneath, but with the front margin of the thorax paler and a dark mark on its disc where the head shows through the chitin, and with indistinct dark areas along the sides of the elytra and near the front part of the suture; the latter forming a median dark mark common to the two elytra; legs and antennæ castaneous, the latter with the clubs not darker; body above and beneath covered with fine pale yellowish pubescence. *Thorax* with base almost straight, only very slightly sinuate on either side of the scutellum, with surface finely punctured, the punctures about twice their own diameter apart. *Scutellum* finely punctured. *Elytra* about as long as their combined breadth, with sutural stria indistinct (not indicated in fig. 10 and in some positions hardly visible) and obsolete in the anterior  $\frac{1}{3}$ , more strongly punctured than the thorax, punctures about twice their own diameter apart; reflexion of lateral margins very slight, scarcely noticeable from above. *Wings* apparently ample, but not dissected out. *Ventral surface* closely punctured, except the middle of the metasternum, which is almost impunctate.

It is not easy to describe the differences separating this form from others. It is not identical with any species I have seen. The following four are selected from Matthews's collection for comparison, as they seem nearest to it. *A. testudinalis*, Woll. (Madeira), is larger, less convex, more parallel-sided, with the dark areas at the sides and suture of the elytra contrasting much more strongly with the paler areas between, and the elytral punctures very much closer. *A. croceus*, Matth. (Siam), is narrower, much less convex, more parallel-sided, and much paler and yellower; in punctuation it is not unlike *A. insulæ-longæ*. The same remarks apply very nearly to *A. senegalensis*, Matth. *A. westwoodi*, Matth. (Ceylon), is larger, proportionately longer, less convex, and generally lighter in colour, though with the darker areas on the elytra much the same as those of *A. insulæ-longæ*; its antennæ are much lighter coloured, being bright yellow; in punctuation it is not far removed from *A. insulæ-longæ*. The latter differs from all these four species in its shorter, more convex, less parallel-sided form, as well as in the other ways mentioned in each separate case.

Reitter (1908, p. 61) has described a species—*A. centrimaculatus*, from East Africa—which seems to resemble *A. insulæ-longæ* in many respects; but without seeing a specimen it is hard to say exactly how the two forms are related. *A. centrimaculatus* is described as "breviter ovalis,"

but as "levissime convexus" and "dilute fulvus," whereas *A. insulæ-longæ* is more convex than several of its congeners and dark castaneous. The dark areas on the elytra of *A. centrimaculatus* appear to be in the same positions as those of *A. insulæ-longæ*.

*Loc.* Seychelles: Long Island, a small coconut-planted islet close to Mahé, vii. 1908. Eight specimens, obtained by beating (probably from coconut-trees).

#### 7. *Arthrolips* sp.

A single specimen, in bad condition, with one elytron broken. So far as can be seen, the form is rather depressed and suboblong—that is, more nearly parallel-sided than in some allied species. Shining, thorax and elytra pitchy black, the thorax paler (dirty ferruginous) in front, and the apices of the elytra, where the light shows through, appearing pitchy ferruginous. Underside of thorax ferruginous, metasternum and first abdominal segment pitchy, hind margins of abdominal segments testaceous. Legs ferruginous; clubs of antennæ not black. Body above covered with fine pale pubescence, much worn in the unique example. *Thorax* very finely and subobsoletely punctured. *Scutellum* and *elytra* with stronger, larger punctures, about their own diameter apart; sutural stria very fine and close to the suture, but distinguishable through almost the whole length of the elytron excepting right at the base. *Wings* present, but not examined. *Ventrally*, metasternum and first abdominal segment finely and rather closely punctured, the punctuation reticulate towards the sides; the pale pubescence is rather dense, especially towards the sides of the sternum and hind margins of the abdominal segments.

Length 1.0 mm.

As the specimen is unique and in bad condition, I have not named it, though it is not identical with any examples I have seen. *A. oblongus*, Matth. (Japan), has the same shape and colour, but is much larger and differently punctured, its thoracic punctures being stronger, while conversely the elytral punctures are finer and more remote.

*Loc.* Seychelles: Silhouette, from Mare aux Cochons or the forest near by, over 1000 feet, 1908.

#### MEIODERUS, Matthews.

*Meioderus*, Matthews, Mon. Corylophidæ, p. 102.

This genus was erected to include a single species—*M. nitidus*, Matth., from Japan,—till now its only known repre-

sentative. The new form described below agrees closely with *M. nitidus* in generic characters—in general shape, form of antennæ, mouth-parts, sterna, tarsi, &c.,—but is quite distinct in specific characters.

8. *Meioderus quinssyanus*, sp. n.  
(Pl. II. fig. 12.)

Sat late ovalis, supra fortiter nitidus, omnino glaber; prothorace unicolore, rufo, scutello elytrisq[ue] unicoloribus, piceis, corpore subtus fusco-testaceo, pedibus antennisque testaceis, harum clavibus haud nigricantibus; prothorace fere impunctato, elytris subtiliter remote punctatis, sine stria suturali.

Long. corp. ca. 1.1 mm.

Rather broadly oval, moderately convex, very shining, and quite glabrous above. *Colour*: prothorax unicolorous reddish, the colour broadly diluted at the translucent front margin, scutellum and elytra unicolorous pitchy, underside brownish testaceous, legs and antennæ testaceous, clubs of antennæ not blackened. *Thorax* rather short, its front margin forming a wide curve; for ordinary purposes it may be called impunctate, though under a very high power a few very remote and exceedingly fine punctures are visible, as indicated in fig. 12. *Elytra* gradually curved, with lateral margin narrowly reflexed, though when viewed from directly above this is generally visible only in front, as shown in fig. 12; punctures fine, remote, shallow, slightly elongate; sutural stria entirely absent. *Wings* ample (mounted in balsam). *Metasternum* and *first abdominal segment* glabrous, the former impunctate in the middle, finely and remotely punctured at the sides, the latter finely and remotely punctured.

*M. nitidus*, Matth., is larger, more elongate-ovate in outline, with thorax much darker; the elytra are much deeper black, their punctuation is, if anything, a little stronger, and a sutural stria is discernible in the posterior part; the ventral surface is much blacker and the metasternum more closely punctured at the sides. When the ventral surfaces of *M. nitidus* and *M. quinssyanus* are viewed side by side the greater relative breadth of *M. quinssyanus* is apparent, and the coxæ of its middle and posterior pairs of legs look even more widely distant, *inter se*, in spite of its smaller actual size.

*Loc.* Seychelles: Silhouette, viii.-ix. 1908.

Four examples, one from near Mont Pot-à-eau, at about 1500 feet, three from Mare aux Cochons, about 1000 feet.

This species is named after Monsieur Le Queau de Quinssy,



last of the French Governors of the Seychelles, who served the Monarchy, the Republic, the Empire, and, finally, the British Government.

SERICODERUS, Stephens.  
(Pl. II. figs. 13-17.)

Subgenus ANISOMERISTES (Matthews).

*Anisomeristes*, Matthews, Ent. Mo. Mag. xxii. 1886, p. 225; Mon. Corylophidæ, p. 108.

*Sericoderus*, pars, Reitter.

*Anisomeristes*, treated by Reitter, and here, as a subgenus of *Sericoderus*, is separated from true *Sericoderus* by having 11-jointed instead of 10-jointed antennæ. Otherwise the species of the two subgenera are closely alike, and it is impossible without examination of the antennæ to decide in which of them any particular form should be placed.

The difference is caused by the fusion of two joints—joint 3 and the succeeding one—in *Sericoderus*, s. str. But in some species at least of this subgenus there is a fine transverse line on the third joint, showing where the division would be if it were present. Fig. 17, made from a balsam-preparation, shows the antenna of a British specimen in the Crotch Collection placed as *S. lateralis*; fig. 17 *a* shows the elongated third joint more highly magnified, and it is clear, both from the shape of the joint and the presence of the transverse line, that it is made up of two joints fused. Figs. 16, 16 *a* illustrate the antenna of *S. (A.) pubipennis*, Sharp (Hawaiian Islands), and figs. 15, 15 *a* give that of *S. (A.) seychellensis*, sp. n. In *pubipennis* the separation of the joints is complete, but not so marked as in *seychellensis*; in *pubipennis* the two joints fit together very closely, while in *seychellensis* the distal one is distinctly narrowed at its base. The condition in *S. (A.) pubipennis*, therefore, seems to be transitional between that in *S. (A.) seychellensis* and that in *S. (s. str.) lateralis*. The antennæ also exhibit other differences in length and in the proportions of the joints *inter se*. But appearances are sometimes deceptive, and much depends on the exact position in which the antenna is lying in the balsam.

In many descriptions of *Sericoderus* spp. no mention is made of the antennæ, and the subgeneric position of some species is not satisfactorily established. Owing to this inadequacy of descriptions, it is hard to say exactly how certain described species are related to the Seychelles form. I have named the latter *S. (A.) seychellensis*, though it may possibly prove to

be identical with some described species which I have not seen.

*Condition of hind wings*: see *ante* (p. 4) and below.

9. *Sericoderus* (*Anisomeristes*) *seychellensis*, sp. n.  
(Pl. II. figs. 13-15.)

Obconicus, nitidus, unicolor flavo-testaceus, pedibus antennisque flavescentibus, harum clavis haud nigricantibus, sat longe aureo-pilosus; prothorace subtiliter punctato, inter punctos lævi; elytris fortius punctatis, inter punctos parum asperatis; antennis curtis.

Long. corp. 0.75-1.0 mm.

Obconic, of the form characteristic of *Sericoderus*—that is, with thorax broader than elytra and produced at the hind angles, and with elytra narrowing gradually from the base backwards, subtruncate at the apices, and with sides straight, not curved. *S. (A.) seychellensis* is narrower in proportion than some of its congeners. It is shining, unicolorous yellow-testaceous, with legs and antennæ yellowish, the clubs of the latter not (or only very slightly) darkened. Body covered above and below with golden pubescence, rather coarser and longer than, and not quite so close as, in some species. *Thorax* smooth, very finely punctured; *elytra* rougher, with coarser punctuation, which extends right to the base. *Wings* considerably longer than elytra (mounted in balsam).

Of all the forms which I have seen, the Hawaiian *S. (A.) pubipennis*, Sharp\*, is nearest to *S. (A.) seychellensis*, but it is larger and has the pubescence and punctuation denser. It also differs in the form of the antennal joints (figs. 15, 15 a). In *seychellensis* the antennæ are short, less than  $1\frac{1}{2}$  times the breadth of the head, while in *pubipennis* they measure over  $1\frac{1}{2}$  times the breadth of the head. In *seychellensis* joint 2 is short and conspicuously broad in proportion, 3 and 4 are short and transverse, and the division between them is conspicuous, 4 being narrowed at its base, 5 is very little broader than long, 6 much more transverse, 7 conspicuously larger than 8, and the club-joints are short, 9 and 10 both being broader than long. In *pubipennis* (figs. 16, 16 a) joint 2 is proportionately much longer, 4 is differently shaped and much less narrowed at its base, 9 and 10 are longer, being about as long as broad. Perhaps characters of a more definite nature than some of those hitherto used may be found in

\* Tr. Dublin Soc. iii. 1885, p. 128; Matthews, Mon. Corylophidæ, p. 121; Scott, 'Fauna Hawaiianis,' iii. p. 417 (1908).

the antennæ to distinguish a number of forms superficially much alike.

Among species which I have not seen, *S. eichelbaumi*, Reitter (1908, p. 62, E. Africa), seems to resemble *S. (A.) seychellensis* in some respects, but to differ (as, according to Reitter, *l. c.*, does also the Australian *S. pallidulus*, Reitter) in having the punctuation of the elytra obsolete towards the base; also *eichelbaumi* and *pallidulus* presumably belong to the subgenus *Sericoderus*, s. str., though this is not actually stated. Certain forms have been described from Australia by Lea\* and from New Zealand by Broun†, but it is impossible to say exactly how they are related to *S. (A.) seychellensis*. *S. (A.) pecirkanus*, Reitter (1908), from Egypt, is, according to the description, different in shape, colour, and nature of the pubescence.

*Loc.* Seychelles: Silhouette and Mahé, 1903-9.

Over fifty specimens, varying considerably in size. In Silhouette several were swept from a grassy clearing at over 1000 feet, 30. vii. 1908, and a large number were beaten all together from one place on the edge of the forest at Mare aux Cochons, over 1000 feet, in the late afternoon of 18. ix. 1908; others were found in various localities both in the high forests and at lower elevations. In Mahé examples were taken in the high forest of Morne Blanc, on Cascade Estate, &c.

#### DAUBANIA, gen. nov.

(Pl. I. fig. 18; Pl. III. figs. 19, 21-24.)

Antennæ (ut in *Oligarthro*) 8-articulatæ, sed ab eis *Oligarthri* in forma articularum differentes. Caput sub pronoto omnino obtectum. Genus in forma mandibulorum, maxillarum, labii, *Corylopho* affinis, sed ab hoc genere in numero articularum antennarum differt.

*Form* (fig. 18) oval, narrowed behind, moderately convex, glabrous above. *Head* entirely concealed beneath pronotum. *Antennæ* (fig. 19) 8-jointed; joint 1 long, thickened, curved towards base; 2 pyriform, over twice as long as broad; 3 slender at base, a little longer than broad; 4 small, a little broader than long; 5 may be reckoned as part of the club, it and 6 are about as long as broad; 7 is rather broader than long; 8 is longer than broad and tapers to a blunt apex. *Labrum* (fig. 21) transversely oblong, anterior angles rounded, anterior margin slightly bisinuate. *Mandibles*

\* Proc. Linn. Soc. New South Wales, vol. x. p. 309 (1895).

† Man. New Zealand Ccl. part 5, p. 1072 (1893).

(fig. 22) armed on the inner margin with a comb of long fine teeth, becoming gradually shorter towards the base. *Maxillæ* (fig. 23) with the lobe finely setose; *maxillary palp* with joint 2 large, obliquely truncate at apex, greatly produced and rounded at the outer apical angle, which bears six long slender laminate processes (cf. *Corylophus*, Matth. Mon. pl. iv. fig. D 5), each of which becomes gradually broader from the base outwards, then tapers to a sharp apex; the outermost one is much the longest and is curved, the others become gradually shorter inwards, the innermost ones being almost the same length; joint 3 very short, transverse; joint 4 a little broader than long, produced at the inner apical angle, rounded off at the outer angle, bearing short hairs on the almost truncate apex. *Labium* (fig. 24), so far as can be discerned, shaped like a spear-head; ligula very large and broadly spatulate, truncate at apex, narrowed at base; *labial palpi* short and broad; joints 2 and 3 both broader than long, 2 shaped like an asymmetrical cup produced on the outer side, 3 a little narrower at its base than the apex of 2, its truncate apex shortly setose. *Prothorax* semicircular, anterior margin explanate, base bisinuate, hind angles produced. *Scutellum* triangular, broader than long, apex blunt. *Elytra* very slightly broader behind the shoulders than the base of the thorax, gradually narrowing behind; outer margins not much curved, explanate for about  $\frac{3}{4}$  of their length, the explanate margin disappearing in the posterior  $\frac{1}{4}$ ; posterior outer angles broadly rounded off, posterior inner angles slightly rounded; a fine sutural stria is present, but vanishes in the anterior  $\frac{1}{4}$  of the elytra. *Wings* ample (mounted in balsam). *Pygidium* rounded, projecting a little beyond the elytra. *Middle coxæ* moderately, *hind coxæ* widely, distant.

*Type* of the genus, *Daubania seychellarum*, sp. n.

The only other known genus of Corylophidæ with 8-jointed antennæ is *Oligarthrum*, Matthews (Mon. p. 127, pl. iv. fig. C), established for a single species, *O. waterhousei*, Matth., described from a unique example from Chili. In *Oligarthrum*, however, antennal joints 2-5 differ absolutely in actual form and relative proportions from the corresponding ones in *Daubania*, as will be seen by comparing figs. 19 and 20, the latter of which is copied from Matthews's Monograph; so that, unless many intermediate gradations come to light, the two insects can hardly be classed in one genus.

The mouth-parts of *Oligarthrum* have not been dissected, but Matthews states that, so far as he could see, they resembled those of *Corylophus*. This resemblance is also marked in *Daubania*, as will be seen by comparing my

figures of the latter with Matthews's illustrations of *Corylophus*.

*Daubania* is dedicated to Monsieur and Madame Edouard Dauban, owners of the island of Silhouette, Seychelles.

10. *Daubania seychellarum*, sp. n.  
(Pl. I. fig. 18 ; Pl. III. figs. 19, 21-24.)

Nitida, supra glabra, prothorace rufo, elytris piceo-nigris ad apicem parum dilutioribus, ore antennis pedibus rufo-testaceis, antennarum clavis infuscatis; prothorace subtiliter obsolete punctato, elytris sat dense strigoso-punctatis.

Long. corp. 0·8 mm.

With the characters of the genus. *Colour*: thorax red, anterior margin paler, translucent; scutellum and elytra pitchy black, the latter diluter towards the apex; underside reddish brown; legs, mouth, and antennæ reddish testaceous, the antennæ with clubs infuscate. *Sculpture* &c.: disc of thorax finely and obsoletely punctured; elytra closely punctured, punctures separated by more than their own diameter, produced into channels or striæ, the general direction of which is longitudinal, though near the suture they become oblique; though quite distinct, these striæ are not very deep, and under high lights sometimes only the actual punctures are visible. *Pygidium* finely pubescent. *Metasternum* with surface finely alutaceous at the sides, smooth in the middle, and with punctuation and pubescence very scanty; in one specimen examined it is bare of pubescence in the middle, the first abdominal segment is also nearly bare and has a median longitudinal depression; in another example this depression is absent, the segment is more pubescent, and the metasternum has some scanty pubescence in the middle in front. These differences possibly may be in part sexual (cf. *Rhyppobius*, p. 26). The other ventral segments are finely punctured and pubescent.

This species is quite distinct in general appearance from all other Seychelles Corylophidæ by its minute size, strigosely punctured elytra, &c. No species of any genus in Matthews's collection superficially resembles it. *Oligarthrum waterhousei* is quite different, being larger, unicolorous blackish, with hind angles of thorax less produced and elytral punctures not drawn out into striolæ.

*Loc.* Seychelles: Silhouette, Mahé, Praslin Islands, 1908-9.

Fourteen examples: in Silhouette, collected at Mare aux Cochons plateau or from the forest near by, over 1000 feet;

in Mahé, from country above Port Gland, 500–1000 feet, and from the forest on Cascade Estate, between 800 and 2000 feet; Praslin, Côtes d'Or Estate.

#### LEWISIUM, Matthews.

(Pl. III. figs. 25–28, 30; Pl. IV. figs. 31, 32, 34, 35.)

*Lewisium*, Matthews, Mon. Corylophidæ, 1899, p. 164, pl. v. fig. A.

*Lewisium* was established for two species—*L. ceylonicum*, Matth. (*op. cit.* p. 166), and *L. japonicum*, Matth. (*op. cit.* p. 167), and no further representative of the genus has since been described. My material contains a long series of a species from the Seychelles, which is referred to *Lewisium* on account of its very close general resemblance to *L. ceylonicum*, but which in the form of its antennæ and mouth-parts differs from that species and in some ways more closely resembles *Catoptyx bowringi*, Matth. (Java), the type of the genus *Catoptyx* \*. The Seychelles form (*L. seychelleanum*, sp. n.) thus seems in some respects intermediate between the types of *Lewisium* and *Catoptyx*, and an examination of the actual parts in *L. ceylonicum* and *L. seychelleanum*, and comparison with Matthews's figures of *Catoptyx* renders one rather doubtful whether the differences between *Lewisium* and *Catoptyx* are more than specific. But one of the chief diagnostic characters of *Catoptyx* is that it has the *anterior angles of the pronotum abruptly inflexed and closely fitted to the sides of the head*, and of this there is no trace in *L. seychelleanum*. Therefore I do not propose to sink *Lewisium* as a synonym of the earlier name *Catoptyx*.

*Antennæ, mouth-parts, &c.*—The antenna of *L. seychelleanum* (figs. 25, 25 a) has the basal joint much thicker, the third joint proportionately much longer, than that of *L. ceylonicum* (figs. 26, 26 a). This forms a ready means of distinction in balsam-preparations. The labrum of *L. seychelleanum* (fig. 27) is intermediate between that of *Lewisium* and that of *Catoptyx bowringi* as figured by Matthews (copied in figs. 28, 29), being considerably more tapering than the former but much less acuminate than the latter. The mandibles of *L. seychelleanum* are bifid at the distal extremity, each of the two apices being armed with two or three hooks (figs. 30, 30 a)—i. e., rather more complex than those of *Catoptyx bowringi*, which, according to Matthews (pl. vi. fig. B 4), have only a single hook at each apex, but

\* *Catoptyx*, Matthews, Ann. & Mag. Nat. Hist. (5) vol. xix. 1887, p. 111; Mon. Corylophidæ, p. 167, pl. vi. fig. B 1–7.

without the serrations that extend some way down the mandibles of *L. ceylonicum* (cf. Matthews, pl. v. fig. A 4). *Maxillary palpi* of *L. seychelleanum* (fig. 31) with joint 2 much less curved and inflated outwardly, and the apical joint shorter and blunter, than those of *L. ceylonicum* (fig. 32); *maxillary lobes* of *L. seychelleanum* slender, sharply pointed, with inner edge serrate near the apex [Matthews figures the lobes in *Lewisium* as unarmed; but a balsam-preparation of the maxilla of *L. ceylonicum* (fig. 32) shows about six minute teeth near the apex, though these are scattered on the surface, not arranged in a serrate edge as in *L. seychelleanum*]. Fig. 33, copied from Matthews, shows the maxilla of *Catoptyx bowringi* for comparison. *Labial palpi* of *L. seychelleanum* (fig. 34) lying nearly contiguous, not spread apart as in *L. ceylonicum* (fig. 35) \*; fig. 36, copied from Matthews, shows the parts in *Catoptyx bowringi*. Therefore in the maxillæ and labium *L. seychelleanum* seems in several points to resemble *Catoptyx bowringi* more closely. *Tarsi* of all three pairs in *L. seychelleanum* broadly dilated and bilobed, the lobes pubescent.

11. *Lewisium seychelleanum*, sp. n.

(Pl. III. figs. 25, 27, 30; Pl. IV. figs. 31, 34.)

Late ovale, postice perparum angustatum, valde convexum, nitidissimum, supra glabrum; piceo-nigrum, prothoracis margine antico pallide testaceo et pellucido, disco prothoracis ante scutellum, scutello ipso, elytrorum sutura et marginibus exterioribus (his anguste) piceo-rufis, antennis pedibusque rufo-testaceis, antennarum clavis haud nigricantibus; prothorace fere impunctato, elytris dense sat fortiter confuse punctatis. *Lewisio ceylonico* simile, sed statura minus, et differt in forma antennarum, mandibulorum, &c., quæ vide supra.

Long. corp. 1.05–1.1 mm.

Broadly oval, slightly narrowed behind, very convex, very shining, glabrous. Pitchy black, with anterior margin of the thorax pale testaceous and pellucid, and the middle of the disc of the thorax before the base, together with the scutellum and suture of the elytra, lighter—*i. e.*, pitchy reddish; outer margins of the elytra also narrowly reddish [in a few specimens the reddish colour is more extended and the whole body is a little lighter]; underside pitchy reddish, centre of metasternum and first abdominal segment darker; legs, mouth,

\* Too much reliance must not be placed on this difference, which may be partly due to greater pressure of the coverslip in one preparation than in the other.

and antennæ reddish fastaceous, clubs of the antennæ not blackened. *Thorax* and *scutellum* under a powerful hand-lens appearing impunctate, but under a compound microscope the thorax is seen to bear numerous very fine subobsolete punctures. *Elytra* closely and strongly punctured, punctures separated by once to twice their own diameter; sutural stria not distinguishable. *Wings* dissected out and found to be ample. *Metasternum* rather closely and strongly punctured towards the sides, but with the elevated central part almost impunctate. *Abdomen* ventrally clothed with fairly close, fine, short hairs.

In general appearance closely resembling *L. ceylonicum*, Matth., which is, however, distinctly larger. The example of *L. ceylonicum* before me appears a very little less convex, has scarcely any reddish colour along the suture of the elytra, the elytra even more strongly punctured, and the metasternum almost impunctate at the sides as well as slightly less elevated in the middle. But differences of a more definite character lie in the form of antennæ and mouth-parts, as stated above.

*L. seychelleanum* is quite distinct in size and general appearance from the other previously described species of the genus—i. e., *L. japonicum*, Matth., and also from *Catoptyx bowringi*, Matth. A second species of *Catoptyx* has been described recently by Sahlberg (1913)—*C. levantinus*, from the Lebanon; but this is said to have the elytra “obsolete punctata” and the third joint of the antenna as long as broad, and must be quite different from *L. seychelleanum*.

*Loc.* Seychelles: Silhouette, Mahé, Long, Praslin, and Félicité Islands, 1908–9. Found much more abundantly than any other species, over 190 specimens being taken; the distribution seems fairly general, from sea-level and the cultivated country up into the endemic forests. In Silhouette many examples were collected from near Mont Pot-à-eau, ca. 1500 feet, and from Mare aux Cochons; a number were swept from long grass; one is recorded as beaten from dead palm-leaves; two were found in fallen dry branches containing nests of the ant *Pheidole punctulata*, Mayr (A. Forel det.), on the coast near Pointe Étienne, 17. ix. 1908. In Mahé, generally distributed from the cultivated country up to elevations of over 1000 feet. In Long Island, a cultivated islet near Mahé, a specimen was taken from the beach just above high-water mark.



## RHYPوبيUS, Leconte.

*Rhypobius*, Leconte, Proc. Ac. Philad. vi. 1852, p. 141.

*Moronillus*, Jacqu.-Duval, Ann. Soc. Ent. France, 1854, Bull. p. 38;

Gen. Col. Eur. vol. ii: 1857-59, p. 234.

Nec *Glæosoma*, Wollaston, Ins. Mader. 1854, p. 480, pl. x. fig. 7.

*Rhypobius*, founded on the North-American *R. marinus*, Leconte, was originally (but erroneously) described as having 9-jointed antennæ. *Moronillus* was erected to contain the European *M. ruficollis*, Duval, and was correctly described as having the antennæ of eleven joints. In 1883 Leconte and Horn [Classif. Col. N. Amer. (Smithson. Misc. Coll. xxvi.) p. 113] asserted that *Rhypobius* and *Moronillus* are really the same, and admitted that Leconte had wrongly stated the number of antennal joints in his original description of *Rhypobius*. Matthews also followed these writers in regarding *Moronillus* as a synonym of *Rhypobius* (Mon. Corylophi. p. 173). Ganglbauer, however (Käf. Mitteleur. iii. 1899, p. 283, footnote), was not satisfied that the number of antennal joints is really the same in the two cases, and therefore employed the name *Moronillus* as distinct from *Rhypobius*. I have made a balsam-preparation of the antenna of a specimen of *R. marinus*, Leconte, from Matthews's Collection. It is undoubtedly 11-jointed, and closely resembles that of *R. aquilinus*, sp. n. (fig. 38). Leconte and Horn and Matthews were therefore right in regarding the number of joints as the same in the type-species of *Rhypobius* and *Moronillus*. The character separating the two disappears, and *Moronillus* must be treated as a synonym of *Rhypobius*. A preparation of the antenna of the West-Indian *R. brevicornis*, Matth., also shows eleven joints.

These remarks, however, do not apply to *Glæosoma*, Wollaston. This genus was founded for *Glæosoma velox*, Woll., which was described from a unique example found in Madeira, but of which other examples, subsequently taken in North Africa, are also to be seen in the British Museum. Wollaston described and figured the genus as having 10-jointed antennæ (an assertion which I am glad to be able to confirm, below). But Duval, in his Gen. Col. Europe, sank *Glæosoma* as a synonym of his genus *Moronillus*. To this Wollaston replied in his 'Coleoptera Atlantidum' (1865, pp. 93-5, and footnotes), saying that he had carefully re-examined the type of *G. velox*, and was convinced that his original figure and description were correct, that the antennæ were really 10-jointed, and that the joints differed in form

*inter se* from those of *Moronillus*. Nevertheless, Leconte and Horn and Matthews regarded *Glæosoma* (like *Moronillus*) as a synonym of *Rhyphobius*; but Ganglbauer (*l. c.*) was not convinced, and Casey (1900, p. 65) wrote that *Glæosoma* is altogether distinct from *Rhyphobius*. I have examined the type of *G. velox* under the highest power applicable to a carded specimen, and found that the antennæ appeared almost certainly 10-jointed; but being still not satisfied, I mounted in balsam the antenna of one of the North-African specimens, which seem absolutely identical with the type. This antenna (fig. 39) is 10-jointed, having between the second and the next large joint one small joint less than in *Rhyphobius*, and, as stated by Wollaston, the form and proportions of the joints differ from those of *Rhyphobius*. The three joints (5, 6, 7) preceding the three club-joints are all much longer in proportion than the corresponding three (6, 7, 8) in *Rhyphobius*, and the large middle one of the three especially is of a different shape.

If the number of antennal joints be used as the criterion for separating the genera, the matter may be summarized thus:—

*Rhyphobius* (= *Moronillus*), antennæ 11-jointed.

*Glæosoma*, antennæ 10-jointed.

*Secondary Sexual Characters*.—I do not know of any reference to these in *Rhyphobius*. But the material before me includes three specimens of a species, apparently new, two of which have a marked impression on the metasternum, while in the third this is quite absent. In comparing certain other species with mine, it was seen that some examples have impressions on the metasternum and sometimes on the first abdominal segment as well. Having before me two specimens of *Rhyphobius ruficollis* (Duval), one of which has the sternum impressed while the other has not, I dissected these and found that the insect with impressed sternum is ♂, while the other is ♀. I therefore infer that the ventral impressions are a ♂ character, though further study is needed to prove whether they are present in all or only in some species. Those in which they have so far been observed are:—

(i.) *R. ruficollis* (Duval), ♂: a rather faint and narrow longitudinal impression on the posterior  $\frac{2}{3}$  of the metasternum, and a long narrow impression down the middle of the first abdominal segment.

(ii.) *R. brevicornis*, Matth., ♂: a deep and rather broader longitudinal impression on the metasternum; on the first abdominal segment a very broad and deep impression, extending the whole length of the segment and nearly the

whole distance between the hind coxæ ; on either side of the impression the segment is raised into a ridge which bears rather long pubescence.

(iii.) *R. aquilinus*, sp. n., ♂ : a marked longitudinal impression, broadening behind, along the posterior  $\frac{3}{4}$  of the metasternum, the pubescence in the impression being much closer than on either side of it ; first abdominal segment with no impression, but with a little median group of hairs.

*Condition of hind wings*: see *ante* (p. 4), and below.

12. *Rhyphobius aquilinus*, sp. n.  
(Pl. IV. fig. 37 ; Pl. V. fig. 38.)

Oralis, postice haud fortiter attenuatus, supra subtusque subtilissime alutaceus, thorace rufo-flavo, elytris castaneo-brunneis postice ad suturam interdum rufescentibus, pedibus antennisque flavescentibus, harum clavis haud nigricantibus ; thorace impunctato ; elytris punctis duplicibus sat confertim munitis ; metasterno ♂ in medio longitudinaliter valde impresso, segmento 1° abdominis haud impresso.

Long. corp. 0.85 mm.

Outline shown in fig. 37 ; the thorax appears a little shorter than it actually is, owing to its being bent down ; length of the elytra very nearly equal to their combined breadth, which is greatest a little before the middle. Body above shining, glabrous ; finely and closely alutaceous above and beneath. *Colour*: thorax reddish yellow, elytra dark castaneous brown, in the type-specimen lighter and more reddish in the posterior half near the suture ; ventral surface castaneous brown, antennæ and legs yellowish, clubs of the antennæ not blackened. *Antennæ* (fig. 38) a little longer than the width of the head from eye to eye. *Thorax* narrowly margined at the sides, with base very shallowly sinuate on either side of the middle, and hind angles (seen from the side) slightly less than right angles ; surface impunctate. *Scutellum* rounded. *Elytra* with lateral margins narrowly reflexed, but in viewing a specimen from vertically above the margins are only visible behind the shoulder and again for a short space behind the middle ; sutural stria quite absent ; surface with fine double punctures, each consisting of two slightly elongated punctures lying close side by side\* ; in a transverse direction the double punctures are about their own diameter apart, but in a longitudinal direction about twice this distance. *Wings*: no trace of these

\* The alutaceous surface and double punctures are characteristic of a number of other members of the genus.

organs can be seen under the partly opened elytra of the single ♀, but actual dissection and search for minute vestigial wings is prevented by the necessity of preserving the specimen intact; the two ♂ have ample wings, folded under the elytra; one of these organs is mounted in balsam, but I have failed to unfold it completely, so cannot state its proportions to the elytron accurately; it is, however, considerably longer than the elytron (see p. 4). *Metasternum* ♂ with a marked median longitudinal impression broadening behind, on the posterior  $\frac{3}{4}$  of its length; surface of the metasternum almost impunctate, with pale short hairs, closer in the impression, very scanty at the sides; in the ♀ the metasternum is convex and glabrous in the middle. *First abdominal segment*: ♂, with no impression, but with a median group of a few short hairs, on either side of which it is bare, but has a few other hairs near the lateral margins; ♀, no median group of hairs. The other segments bear scanty pale pubescence.

This species is quite distinct from any I have seen. The form most closely resembling it superficially is *R. brevicornis*, Matth. (West Indies). A ♂ of this, now before me, is the same size, but more attenuated behind; the reticulation of its thorax is slightly less marked, while its elytral punctures are a little stronger; and it differs decidedly in the nature of its ♂ ventral impressions (*vide supra*, p. 26).

*Loc.* Amirantes Islands. Three specimens from Eagle Island, 1905 (H.M.S. 'Sealark' Expedition).

Named "*aquilinus*" in allusion to the island of its discovery.

#### ORTHOPERUS, Stephens.

(Pl. IV. figs. 40, 41; Pl. V. figs. 42-44.)

The material includes at least two, possibly three, species of this genus: a new and very distinct form from Rangoon; a single ♂ from the Seychelles, referred to a species known from S. America and W. Indies; and a single indeterminable specimen from Rangoon, possibly the ♀ of the preceding, possibly distinct.

*Diverging Striæ on Metasternum.*—I have found in the literature no mention of diverging striæ or lines on the metasternum, curving round behind the middle coxæ (fig. 41, l.); yet they are present in a number of species. They recall the diverging striæ found in a similar position in *Acritus* and other Histeridæ, but in these there is a second pair of diverging striæ behind the hind coxæ on the first abdominal

segment, while in the *Orthoperi* there is only the pair on the metasternum. The species in which I have seen them are :—*æqualis*, Sharp, *atomarius*, Heer, *brunnipes*, Gyll., *coriaceus*, Rey, *crotchii*, Matth., *kluki*, Wank., *munice*, sp. n., *ovatus*, Matth. I have not examined the other species of the genus as to whether these striæ are present or not.

*Secondary Sexual Characters.*—More than one writer has noted that the front tibiæ of some *Orthoperus* are long and incurved at the apex. Thus Matthews, in his description of the genus (Mon. p. 182), “[anterior] tibiæ often very long and much incurved, abruptly incurved at the apex”; and again, in his descriptions of some of the species, “anterior tibiæ very long and strongly incurved,” or, contrariwise, “anterior tibiæ nearly straight” (see also his figure, pl. vii. fig. A 1). But it does not seem to have been stated that this difference in the form of the tibiæ is, in some species at least, sexual. Thus, in *O. munice*, sp. n., the front tibiæ of some specimens, which I infer to be ♂, are more incurved towards the apex, and have a sharp heel or spur at the inner apical angle (fig. 42); while those of other examples, presumably ♀, which in all other external characters appear identical with the preceding, are straighter and have no such heel (fig. 43). In this case the curvature of the ♂ tibia is not very marked, but it is much greater in *O. minutissimus*, Matth. (fig. 44). Dr. Sharp has pointed out to me the same kind of sexual difference in the form of the front tibiæ in some of our British *Orthoperus*. The divergence of the sexes in this respect is sometimes quite sufficient to be seen with a hand-lens.

Casey (1908, p. 65) describes for certain North-American forms a new genus *Eutrilia*, one of the principal characters of which is that it has the front tibiæ more flattened and less incurved at the apex than in *Orthoperus*. It will be necessary to discriminate between sexual and other differences before the limits of the two genera are made quite clear.

### 13. *Orthoperus munice*, sp. n.

(Pl. IV. figs. 40, 41; Pl. V. figs. 42, 43.)

*Ovatus*, valde convexus, nitidissimus, glaber, piceo-fuscus, pedibus antennisque testaceis, harum clavis infuscatis; thorace serie basali punctorum fortium ad latera hand attingente, in medio a basi magis distante, munito, disco subtilissime ac subobsolete punctato; elytris sat dense sed subtilissime ac subobsolete punctatis; ♂ tibiis anterioribus ad apicem parum incurvatis, angulo apicali interiore producto.

Long. corp. 0·7 mm.

Ovate, very convex, shining, smooth (not at all alutaceous), and quite glabrous above; body above and beneath and head pitchy fuscous; legs, palpi, and antennæ testaceous, clubs of the latter infusate. *Head* impunctate. *Thorax* with its base sinuate on either side and produced backwards in the middle, with lateral margins (seen from the side) slightly sinuate in the middle, hind angles nearly right angles; with a strong basal series of rather elongate punctures, becoming obsolete at the sides, further removed from the actual base in the middle than at the ends of the series [it recalls the basal series of some species of *Aceritus*]; disc bearing a number of very fine subobsolete punctures, but in some lights and positions these are scarcely visible. *Elytra* of nearly the same length as their combined breadth, considerably larger than the abdomen, the outline of which is shown in fig. 40 appearing through the elytra as a dotted line (perhaps some allowance must be made for shrinkage of the abdomen); lateral margins not visible from directly above; the elytra have no trace of a sutural stria, and are finely and rather closely punctate; the punctures under a high power appear as fine elongate dashes, closer at the base and suture, and almost obsolete towards the apex (like those on the thorax, the punctures in some lights and aspects are difficult to see owing to their shallowness). *Wings* ample. *Metasternum* (fig. 41) very convex, impunctate in the middle, finely punctured at the sides, the diverging striæ behind the middle coxæ are punctured and run in a continuous curve from the anterior to the lateral margins of the metasternum. *Abdomen* in several specimens tapering to a blunt point, first segment almost impunctate, each segment with a series of very fine short hairs, rather wide apart. *Front tibiae* of ♂ (fig. 42) slightly incurved towards the apex, with the inner apical angle produced into a sharp heel; in both ♂ and ♀ (for the latter sex, see fig. 43) the excavation of the outer margin towards the apex is conspicuous. No other external sexual distinction is visible.

No species in Matthews's Collection resembles this at all closely, and those described since his time seem quite different. *O. japonicus*, Matth., has a basal thoracic series of punctures, but they are much finer; it is much larger than *O. munia*, has a minutely reticulate surface, and much closer elytral and thoracic punctuation.

*Loc.* Rangoon. Six examples, found in nest of *Munia striata*, 9. x. 1911 (*Dr. H. H. Marshall*).

14. *Orthoperus minutissimus*, Matthews (?).

(Pl. V. fig. 44.)

*Orthoperus minutissimus*, Matthews, Mon. Corylophidæ, 1899, p. 196.

A single ♂, in bad preservation. Pitchy fuscous, legs and antennæ lighter, shining and quite glabrous above. Thorax not (or scarcely) punctured. Elytra finely and sub-obsolete punctured, the punctures more than their own diameter apart. Ventrally the metasternum is impunctate in the middle, but its sides and the first abdominal segment have very fine punctures several times their own diameter apart. Wings not examined.

So far as can be seen in its bad condition, the specimen agrees in size, colour, and punctuation with an example in Matthews's Collection from Grenada, West Indies, placed as *O. minutissimus*\*. The two agree particularly in the form of the front tibiæ, which are sharply incurved at the apex, the inner apical angle forming a sharp heel. Fig. 44 shows the right-hand front tibia in the West-Indian specimen.

Loc. Seychelles: Silhouette, from Mare aux Cochons, 1000 feet or more, ix. 1908. *O. minutissimus*, Matth., is recorded from South America and West Indies.

15. *Orthoperus* sp.

Among the material from Rangoon is a single specimen, perhaps not fully mature, of a very minute species, quite distinct from *O. munia* by the absence of the basal thoracic series of punctures. In size and punctuation of the upper surface it is not unlike the example from Silhouette described above and referred to *O. minutissimus*. It is just possible that it is a ♀ of that species, since it probably belongs to the ♀ sex, the front tibiæ not being incurved and having no sharp heel. The metasternum appears quite impunctate, even at the sides; diverging striæ perfectly distinct but not punctured. Determination or further description of this form is impossible in the absence of more material. Wings not examined.

\* The name and description of *O. minutissimus* are published in square brackets in Matthews's Monograph, from his own MS. notes, by P. B. Mason, editor of the Monograph. Mason gives reasons for thinking that Matthews probably intended to sink this name as a synonym of *O. perpusillus*, Matth. I have, however, provisionally retained the name *minutissimus*, since time has not admitted of an examination of Matthews's material sufficiently close to decide whether *minutissimus* and *perpusillus* are identical or not.

32    *On Corylophidæ from the Seychelles and Rangoon.*

Length about 0·7 mm.

*Loc.* Rangoon : from nest of *Munia striata*, 9. x. 1911  
(*Dr. H. H. Marshall*).

EXPLANATION OF THE PLATES.

NOTE.—The figures of whole insects are approximately, but not exactly, to scale: they are magnified between 47 and 57 diameters, in most cases 50–53 diameters.

PLATE I.

- Fig.* 1. *Sacium picaultianum*, sp. n.  
*Fig.* 2. Ditto. Mentum.  
*Fig.* 3. Ditto. Underside of prothorax and anterior coxæ.  
*Fig.* 4. *Sacium grossinianum*, sp. n.  
*Fig.* 5. Ditto. Mentum.  
*Fig.* 6. Ditto. Underside of prothorax and anterior coxæ.  
*Fig.* 7. *Sacium roslanianum*, sp. n.  
*Fig.* 8. Ditto. Mentum.  
*Fig.* 9. *Sacium rochoninum*, sp. n. Mentum.  
*Fig.* 10. *Arthrolips insule-longæ*, sp. n. Outline.  
*Fig.* 11. Ditto. Punctuation and pubescence of thorax and elytra, to larger scale.  
*Fig.* 18. *Daubania seychellarum*, gen. et sp. n.

PLATE II.

- Fig.* 12. *Meioderus quinssyanus*, sp. n.  
*Fig.* 13. *Sericoderus* (*Anisomeristes*) *seychellensis*, sp. n. Outline.  
*Fig.* 14. Ditto. Sculpture and pubescence of thorax and elytra, to larger scale.  
*Fig.* 15. Ditto. Antenna. 15 *a*, joints 3 and 4 more highly magnified.  
*Fig.* 16. *Sericoderus* (*Anisomeristes*) *pubipennis*, Sharp. Antenna. 16 *a*, joints 3 and 4 more highly magnified.  
*Fig.* 17. *Sericoderus* (s. str.) *lateralis*, Gyll. Antenna. 17 *a*, joint 3 more highly magnified, showing transverse line.

PLATE III.

- Fig.* 19. *Daubania seychellarum*, gen. et sp. n. Antenna.  
*Fig.* 20. *Olgarthrum waterhousei*, Matthews. Antenna (from Matthews, Mon. Coryloph. pl. iv. fig. C 7).  
*Fig.* 21. *Daubania seychellarum*. Labrum.  
*Fig.* 22. Ditto. Mandible.  
*Fig.* 23. Ditto. Maxilla.  
*Fig.* 24. Ditto. Labium.  
*Fig.* 25. *Lewisium seychelleanum*, sp. n. Antenna. 25 *a*, joints 3–6 more highly magnified.  
*Fig.* 26. *Lewisium ceylonicum*, Matthews. Antenna. 26 *a*, joints 3–6 more highly magnified.  
*Fig.* 27. *Lewisium seychelleanum*. Labrum.  
*Fig.* 28. *Lewisium* sp. Labrum (from Matthews, pl. v. fig. A 3).  
*Fig.* 29. *Catoptyx bowringi*, Matthews. Labrum (from Matthews, pl. vi. fig. B 3).  
*Fig.* 30. *Lewisium seychelleanum*. Mandible. 30 *a*, apex of another specimen from a different point of view.



## PLATE IV.

- Fig. 31. *Lewisium seychelleanum*. Maxilla.  
 Fig. 32. *Lewisium ceylonicum*. Maxilla.  
 Fig. 33. *Catoptyx bowringi*. Maxilla (from Matthews, pl. vi. fig. B 5).  
 Fig. 34. *Lewisium seychelleanum*. Labium.  
 Fig. 35. *Lewisium ceylonicum*. Labium.  
 Fig. 36. *Catoptyx bowringi*. Labium (from Matthews, pl. vi. fig. B 6).  
 Fig. 37. *Rhyphobius aquilinus*, sp. n. Outline.  
 Fig. 40. *Orthoperus munice*, sp. n.  
 Fig. 41. Ditto. Metasternum and first abdominal segment, middle and posterior coxal cavities shaded; *l*, diverging metasternal line or stria.

## PLATE V.

- Fig. 38. *Rhyphobius aquilinus*, sp. n. Antenna.  
 Fig. 39. *Glæosoma velox*, Wollaston. Antenna.  
 Fig. 42. *Orthoperus munice*, sp. n. Anterior tibia and tarsus, ♂.  
 Fig. 43. Ditto. Ditto, ♀.  
 Fig. 44. *Orthoperus minutissimus*, Matthews. Anterior tibia and tarsus, ♂.

II.—*Notes on Exotic Chloropidæ*. By C. G. LAMB,  
 M.A., B.Sc., Clare College, Cambridge.

THE following notes are based on material from two sources. The larger portion is the collection of Diptera in the Zoological Department of Cambridge University, and will be referred to as "Cam. Coll." In 1904 Mr. F. Muir presented a very large collection of Diptera from Africa to the Cambridge Museum, and his specimens will be marked "F. M." In addition, the Museum was indebted to Dr. G. A. K. Marshall for many other specimens from the same region, and there have been various other small accessory collections incorporated from time to time. The other portion consists of specimens kindly submitted to the author by Dr. G. A. K. Marshall—they are part of the extensive collection being formed by the Imperial Bureau of Entomology; this will be referred to as "Bur. Coll."

All the insects listed and described in the paper will be deposited in the British Museum, and hence no indication of the situation of the type-specimens will be given after the descriptions; they will all be in the British Museum.

The task of dealing with this family is enormously lightened and simplified by the valuable and complete monographs of Th. Becker, which bring the information

available up to the dates of publication of the same, and hence save much labour in searching out old records. These monographs are:—

- I. Theil. Palæarctic Region.  
'Archivum Zoologicum,' i. 1910.
- II. Theil. Ethiopic Region.  
Ann. Mus. Nat. Hung. vii. 1910.
- III. Theil. Indo-Australian Region.  
Ann. Mus. Nat. Hung. ix. 1911.
- IV. Theil. Nearctic Region, Neotropical Region, and Addendum.  
Ann. Mus. Nat. Hung. x. 1912.

The last brings the list of known species in all the regions up to date; it also contains a discussion of Enderlein's new genera (Sitz. d. Gesell. Nat. Freunde, 1911), and clears up many points in that paper which at one time seemed likely to throw the classification into confusion.

These monographs will be shortly referred to by the numbers I., II., III., IV. after Becker's name.

As is so often the case, a considerable number of single specimens occur in both collections. Where the characters are quite unmistakable and striking, these single specimens have been described as the types of new species. When the specimen agrees with fair accuracy with any published description, it has been thought best to place the insect under the existing name; but in general it will be found that this fact is referred to, and any differences recorded.

The Chloropidæ form a very protean family and include great numbers of genera that run fairly closely into one another. It might be said that almost every positive character which limits the family may be separately absent in some genera—in fact, the allocation of an insect to the family is in many cases practically due to a "trained eye," and cannot be logically justified by the limits of the definitions of the family. This is possibly more true of this family than of any of the other Acalyptrate groups.

It naturally results that the generic limitations follow the same tendency, and that the original limits of a genus, as set by its founder, have to be transgressed, so that finally the "genus" sometimes bears little resemblance to the limited form originally prescribed. A good example of this is to compare *Gaurax* as founded by Loëw with Becker's latest concept of the species forming that assemblage.

Such a sequence of events is, from the nature of the case, inevitable, though it leads to much difficulty both in tracing species and in assigning genera. The fact is that in some groups of the Oscininae there is no natural line or lines of demarcation; even the known forms merge into one another and share characters that should belong to different genera as originally defined; and when the world forms are really adequately studied there can be no doubt but that this tendency will be increased.

It will follow that it is quite possible that the author may have assigned species to definite genera which, in the opinion of more experienced students, should be placed elsewhere. For this reason the descriptions are often made a little fuller than would be necessary to enable one to discriminate between the species of a sharply bounded genus such as *Chyliza*. For the same reason it will be found that he has been compelled to place species in genera whose specification does not exactly meet the case. A good example is *Lagaroceras anomalum*; if the head were removed it would be impossible to distinguish this species from one of the described forms of Becker's *L. megalops*; but the antenna and vertical triangle are both considerably at variance with the forms described as characterizing the genus. Wide interpretation of generic limits is unavoidable in this family, for if definite and fixed generic characters were to be adhered to, the family would mainly consist of monotypic genera.

The author hopes to be able to continue with some other of the Acalyprate families if time and opportunity permit.

*Note.*—To save space certain abbreviations will be used. When describing the head the word "triangle" will refer to the fronto-vertical macula usually found there, though its shape varies greatly. The antennal joints will be referred to by number only—thus "3rd" will mean third joint of the antenna. In the case of the thorax the word "callus" will refer to the front thoracic callus unless qualified. In the wings the veins will be referred to by the old system of numbers as being more convenient and simple in this case; thus, "2nd" will mean the second long vein. Similarly, the costal segments will be referred to by the numbers of the long veins that end there—thus "2 to 3" means costal distance between ends of second and third long veins measured on costa.

*CHLOROPINÆ.**PACHYLOPHUS*, Loëw.

The following species were in the collections :—

- P. lugens*, Loëw. Cam. Coll., Durban (*F. M.*).  
*P. splendidus*, Ad. Cam. Coll., Durban (*F. M.*).  
*P. proximus*, Ad. Cam. Coll., Durban (*F. M.*).  
*P. fossulatus*, Ad. Cam. Coll., Durban (*F. M.*).  
*P. varipes*, Ad.; a very pale-legged form. Cam. Coll.,  
 Durban (*F. M.*).

In addition, there were many specimens included in the ordinary black-vertexed section. To this section belongs

Fig. 1.



Fig. 2.



Fig. 3.

Fig. 1.—Wing of large form of *P. frontalis*.Fig. 2.—Wing of small form of *P. frontalis*.Fig. 3.—Wing of *P. frontellinus* (?).

Loëw's species *P. frontalis*; Becker, in his monograph, only recognizes as valid that single species in the section with black triangle, prominent head, and pale femora. He sinks as synonyms both Bezzi's *P. tellinii* and Speiser's *P. frontellinus*. As regards the first, he makes out what is apparently a good case, but gives practically no reasons for the second. If one studies the fairly long series in the Cam. Coll., it can be seen at once that there are two quite definite venations present, shown in figs. 2 and 3. The species with the cross-veins fairly apart has a dullish frons, with the triangle little marked, but a raised shining black central

line, and this form agrees quite well with the description of *frontalis*. The species with the more approximate veins is a little smaller and its vertical "triangle" is more shining; the raised central line tends to be multiple—in fact, it agrees very closely indeed with Speiser's description of *frontellinus* (Kilimandjaro Meru Exp., Diptera, x. p. 198). In the Bur. Coll. are specimens still more robust than the first species, with venation as in fig. 1 and with rather more glassy wings, but otherwise practically identical with the first series.

It appears best to consider the first and last sets of specimens as belonging to *frontalis*, and the other to *frontellinus*; in none of the published descriptions is any figure of the venation given.

*P. frontalis*. The large form: Bur. Coll., Durban (*L. Bevis*).

The smaller form: Cam. Coll., Durban (*F. M.*).

*P. frontellinus*. Cam. Coll., Durban (*F. M.*).

Three species in the collection belong to the smaller section of the genus with a pale vertical triangle. Hitherto there are described but two species in this section (Becker, II., p. 388). Neither of these species accords with the specimens in the collection, and hence they must be considered new.

*Pachylophus lituraticrus*, sp. n.

This species belongs to Becker's section with pale legs and triangle (II. p. 387).

Head (top view):—Vertex nearly as broad as twice the visible eye-breadth, somewhat transversely concave on the front, bright dullish yellow; the triangle is shining orange without furrows &c., extending not quite to the frons, with a rounded darkened tip, very slightly concave sides, and with the vertical base just less than the eye-distance; the ocellar spot black. In profile the angle between the vertical and facial tangent-planes is a little less than  $90^\circ$ , the frons being just visibly prominent. The pale yellow cheeks are about  $\frac{2}{3}$  the depth of the 3rd joint; the latter is quite normal, yellow except for the part below arisal insertion; the latter is black and of usual form. Palpi yellow. Hind head orange; a darkening behind the ocellar spot, and a pale spot each side just at the top angle of the eye, on which the tiny vertical bristles stand.

Thorax: dorsum elegantly striped; along the middle is a broad stripe of reddish brown bordered by pale narrow

stripes, which are less covered with the tiny bristles clothing the rest of the dorsum—hence these pale stripes are made more conspicuous; beyond these down to the notopleural suture the dorsum is again reddish brown, though less intense; callus with a black central spot surrounded by yellow; pleura orange, shining. Scutellum with its middle third occupied by a bright yellow longitudinal stripe, bounded by black, though the extreme hind angles are pale; terminal crossed bristles just at the end of the black stripes; the surface is very faintly and sparsely striate.

The venation is exceptional; the cross-veins are much approximated, being separated by a distance rather less than  $1\frac{1}{2}$  times the length of the hind cross-vein. The discal cross-vein is a little beyond the costal ending of the 1st; wings clear, with pale orange veins. Halteres white.

Legs all yellow, except for an infuscation on the front tibia and tarsus and on the last joints of the other tarsi. A very striking and constant character is a darkened "brand" on the back of the hind tibia; this brand occupies about  $\frac{1}{3}$  the length of the tibia. Similar structures can be just seen on the legs of other species, but are not coloured in them; they also occur in other Chloropid genera.

The abdomen is the same colour as the thorax, the margins narrowly paler, and has a well-marked interrupted darkened middle line.

The intensity of the reddish colour of the insect varies to a fair extent.

Length (excluding antennæ) nearly 3 mm.

A long series in Cam. Coll., Durbau (*F. M.*).

*Note.*—It is just possible that this species is the same as Becker's *P. contractus* (II. p. 393); but it is unlikely that so careful an observer should not mention the "brand" or the relation of the cross-veins.

*Var.*—There is a single specimen with a slightly paler triangle and no visible dark brand. This is in the Bur. Coll., Manganallur, Tangore. Although the localities are so far apart, the insect is not specifically separable.

#### STELEOCERUS, Beck.

*S. lepidopus*, Beck. Cam. Coll., from Chirinda Forest  
(*G. A. K. M.*).

*Steleocerus nigricornis*, sp. n.

This species is next to Becker's *S. longicollis* (II. p. 401), but differs as follows :—

The halteres are grey, not white; the jowls are larger, about  $\frac{1}{3}$  the depth of the third antennal joint; the tongue is pale, not black; the antennæ are all deep black, not red; legs a little paler; wings more normal, with rounded anal angle.

Size  $5\frac{1}{2}$  mm.

Cam. Coll., Durban (*F. M.*).

*S. ensifer* (?), Thoms.

A single specimen agrees fairly with Thomson's description (Eug. Resa, p. 605), but it is possible that we have another species here. The legs are quite pale; the frontal triangle is not all yellow, but is very much suffused with shining brown, which does not, however, entirely cover the triangle, but occupies the base and shades off forward. One cannot be sure of the identification from this single specimen.

Bur. Coll., Mysore.

There is an immature specimen in Bur. Coll. from Coimbatore, Madras, which is near *S. formosus*, Beck.

*Steleocerus quadrivittatus*, sp. n.

From the Chirinda Forest, S. Africa, we have a few specimens of a species of the *ensifer-tenellus* group.

Head (top view):—Frons yellow and dull, the triangle equilateral, with nearly straight sides; basally it practically touches the eyes and extends by a sharp point right to the front; it is suffused with shining brown, which leaves narrow yellow side-lines and broader boundaries on the hind head, where the black part of the triangle's base extends as a broad stripe down the hind head. Side view: outline fairly circular, the frontal and facial tangent-planes making about  $90^\circ$ , and the hind jowls large; eyes oval, oblique forwards, with narrow lower jowls less than half the width of 3rd; all the side is whitish yellow. Antennæ rather large, the 3rd projecting backwards a little, so as to be a longish oval with axis parallel to body-axis; it is yellow, but darkened dorsally; 2nd yellow, arista normal. Face, palpi, &c., all pale yellow.

Though there are but few specimens, the thorax varies somewhat in amount of darkening; dorsum with a broad

black central stripe, sometimes getting browner behind, and extending forward right on to the prothorax; each side is a grey pollinated line of ochreous tone, which is moderately distinct till just before the scutellum, where it suddenly becomes very marked and forms an elongate spot at each side of scutellar base; similarly in front, just at level of calli, it again forms bright long spots; beyond these grey lines the dorsum is as the mid-line, but is more darkened in front of the cross-suture, in one case quite black there. Calli shining, rather orange. Pleura all somewhat shining orange, with brownish boundaries to the sclerites; the black spot over middle coxa may or may not be present. Scutellum darkened orange, in one case paler in centre; terminal bristles long and crossed, and a few smaller marginal ones.

Wings clear with brown veins, 2nd ending about  $\frac{2}{3}$  down costa between 1 and 3. Halteres white, with orange stalks.

Legs orange, with front tibia and tarsus a very little darkened.

Abdomen yellowish at sides, the dorsum forming a broad darkened continuous stripe.

Size (ex. antennæ) just under 2 mm.

Cam. Coll., Chirinda Forest, S.A. (*G. A. K. M.*).

The second species is represented by but a single specimen, but it is very distinct from all the others.

*Steleocerus flavipes*, sp. n.

Head (top view):—About  $1\frac{1}{4}$  times as long as broad; from vertex to the slightly prominent frons it is all bright yellow; the triangle is very shining, especially along its concave side boundaries; these are slightly depressed, and the hair-lines on them are exceptionally well marked; the sharp-pointed apex projects between the somewhat swollen antennal pits; basally it does not quite occupy the whole vertical breadth; eye-margins narrowly silvery, especially in front; ocellar circle black; hind head absolutely pale except for two excessively narrow dark lines from vertex. Side view:—The angle between frontal and facial planes is about  $75^\circ$ ; antennæ all quite pale yellow, except that the 3rd joint is orange just at the insertion of the black arista, which is more elegantly and regularly haired than in the other species. Jowls pale yellow; palpi pale. In front the mouth-margin is seen to be very narrowly darkened.

Thorax reddish orange, with the following greyish pollinated stripes:—Centrally a short narrow one extending but



a little distance on the disc, each side of this another which runs to the outer angles of the scutellum, diverging as they go; beyond these the orange is very slightly suffused with grey; calli shiny orange, pleura the same. Scutellum blackened orange, slightly punctate.

Wings yellowish, with orange veins; small cross-vein just perceptibly beyond the costal ending of the 1st; hind one about 3 times its length from the former, and with its distance from the lower end to the 5th vein-ending about  $1\frac{1}{2}$  times the distance apart of the cross-veins.

Halteres quite white, with yellowish stalks.

Legs entirely yellow, with no darkening at all.

Abdomen all darkened orange, with very narrow palish hind margins.

Size nearly 3 mm.

Cam. Coll., Mozambique (*F. M.*).

*Steleocerus latiseta*, sp. n.

There is a single specimen of a very distinct species.

Head (top view):—Frons dull orange, lighter over antennæ, the triangle is remarkable in form; basally it just does not touch the eyes; the margins are formed by raised straight ridges; about halfway a sudden diminution in breadth occurs, so that the side boundaries at that point are suddenly shifted inwards; the space between these forward parts of the ridges is necessarily a little depressed, but down the centre runs a very fine raised ridge, which goes to the front of the head to just behind where the side-ridges meet in a slightly rounded curve; the whole is shining bluish black except the extreme tip, over which the frontal orange runs; ocelli bright chestnut. Back of head entirely black. Side-view:—Eyes very large, only leaving very narrow lower and fairly narrow hind orange jowls; the orange frons is just visible, the 3rd is orbicular and all orange; the arista is a little broader than usual and tapers to a fine point.

Thorax: dorsum dullish black, pollinated more and more strongly with brown pollen towards the scutellum; the pre-scutellar depression is present, but is not sharply demarcated from the rest. Scutellum as thorax, with divergent bristles. The calli and an area below all orange, the pleura shining dark brown, with a few lighter areas interspersed.

Wings clear, with brown veins, but with a faint smoky cloud between 3 and 4 extending nearly to level of costal ending of 2; the second vein long, as in *lepidopus*.

Halteres with white knobs.

Legs entirely yellow, except that the last two joints of the very slightly dilated front tarsi are suffused.

Abdomen all rather shining brownish black.

Size (ex. antennæ) 2 mm.

Cam. Coll., Chirinda Forest, S.A. (*G. A. K. M.*).

#### MEROMYZA, Meig.

*M. capensis*, Loëw.

There is a long series in Cam. Coll. which shows the very considerable variation in abdominal and other infuscation that occurs in this species.

Cam. Coll., Durban (*F. M.*).

Cam. Coll., Salisbury, Mashonaland (*G. A. K. M.*).

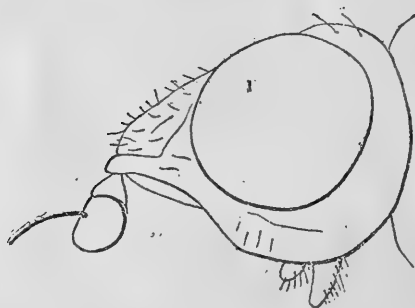
Bur. Coll., Zomba, Nyasaland (*H. Stamus*).

#### EURINA, Meig.

*Eurina oculata*, sp. n.

There are two females in the Bur. Coll. which belong to this genus, but do not fit with any of the hitherto described species. The eyes are larger than in most, being more of the proportion shown by Meigen in S.B. vi. tab. lv. fig. 10, though the frons is less protuberant.

Fig. 4.



*Eurina oculata*,  $\times 40$ .

Head (top view):—Breadth nearly twice the distance from vertex to tip of frons; vertex concave; eyes prominent and practically bare; frons ending in a rounded cap containing the antennal bases. The colour of frons &c. is pale brown, dull; the rather darker triangle is nearly equilateral, more shiny, with base about  $\frac{5}{6}$  vertical cross-breadth;

it ends in a very sharp raised ridge extending to the antennal cap; the boundary is formed by two darkened furrows bordered interiorly by two or three smaller parallel furrows; the frons itself (along eye-margins exteriorly to the triangle) has two very deep and broad furrows extending along the sides of the triangle from the vertex to end of the triangle; the minute pairs of vertical bristles stand at the beginning of these furrows. Ocelli brown, with tiny ocellars each side of the front ocellus. The hind head is darkened behind the ocellar triangle except along the actual vertex, which is yellow in two long confluent spots; the rest of hind head is brownish yellow.

Side-view :—The eyes are larger than usual, nearly circular, though slightly longer horizontally than vertically; the frons is hence less prominent than usual, the distance from antennal base to eye-margin being about 0·3 of the horizontal eye-breadth; the profile is less triangular than usual, there being well-marked horizontal jowls of about  $\frac{1}{4}$  the eye-depth running into the frons by a concave face-line. The side is all brown-yellow except that the frons is there infuscate. Antennæ black, small 2nd joint, 3rd elliptical; arista pale, but brown on the swollen basal joint. The pale face has a slight central swelling below antennæ. Palpi orange.

Thorax discally grey; two mid-stripes darker, extending from front to back, just separated till towards the scutellum, where they meet; alongside these stripes is an interrupted dark stripe forming a spot about the position of the cross-suture, and a longer continuing stripe extending to the scutellum; just above the side-suture is a similarly broken indistinct line; callus and pleura dull orange-brown. Scutellum orange, swollen, rounded in profile, hairy, especially on the margins, though no true bristles are present; it is darkened discally, with the orange showing through as a narrow stripe.

Wings normal, with thick veins; the thinning out of the 4th vein occurs suddenly at about  $\frac{1}{3}$  of its length; cross-vein rather oblique. Halteres orange, with dark stalk.

Legs all orange-brown like the pleura, but slightly infuscate dorsally on all the femora (less so on the front pair), on the tibiæ, and hind tarsi.

Abdomen somewhat flattened, dark brown, with sharp narrow whitish margins; ventrally all pale.

Size 4 mm.

Bur. Coll., Hagari, Madras Presidency.

Note :—"Feeding on leaf-parenchyma of grass."

*LAGAROCERAS*, Becker.

There appear to be five species that fall within the limits of this genus, of which at least three appear to be undescribed. They all agree with Becker's diagnosis very fairly, except that in two of them the 3rd antennal joint is broader than he figures for his type-species, and is more simply a long oval; there appears, however, to be no good reason for not placing them in his genus.

*L. megalops*, Beck.

There is a single specimen which agrees very fairly with Becker's description and figure; the dorsum is quite blackened all over, so that the three stripes are here confluent.

Cam. Coll., Mozambique (*F. M.*).

*Lagaroceras anomalum*, sp. n.

There are several specimens of a species which very closely resembles the above specimen in thoracic and abdominal colour, in the legs and general facies, but is a little larger. The differences are, however, marked and constant; they are (1) the triangle, which has a different form; it is not truly leaf-shaped, as in the generic diagnosis, but is practically triangular, with concave (not convex) sides; it extends to the front of head: (2) the antennæ are relatively shorter, though still nearly as long as the face; the third joint is not quite twice as long as the second and is about  $1\frac{1}{2}$  times as long as broad; it is oval in form, with the upper tip sharply rounded.

Size (excluding antennæ) 3 mm.

Cam. Coll., Durban (*F. M.*).

*Lagaroceras pulchellum*, sp. n.

This is a fine handsome species of the *megalops* group.

Head (top view):—As broad as thorax; frons black except anteriorly just above the antennæ, where it is orange; the surface is dusted with greyish pollen and has many small hairs; the triangle is highly polished black and is of a pointed leaf-shape, the sharp stalk extending right to the base of the antennæ; the base is rounded and occupies a little over  $\frac{2}{3}$  of the vertical breadth. The head-bristles are well marked; the back of the head is black. Side-view:—Profile a little more trapezoidal than normal, the line from

antennal base to mouth-edge nearly straight; jowls about equal in breadth to that of the 3rd antennal joint—they are silvery, as are the hind jowls. The antennæ are inserted just on the edge of the orange frons and are just about as

Fig. 5.

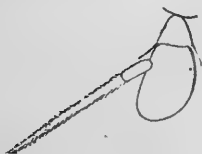


Fig. 6.

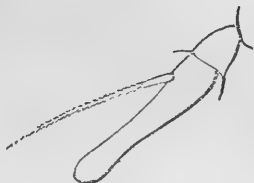


Fig. 7.



A.



B.

Fig. 8.



Fig. 5.—*Lagaroceras anomalum*,  $\times 50$ .

Fig. 6.—*Lagaroceras longicorne* (P),  $\times 50$ .

Fig. 7.—A. *Lagaroceras megalops*,  $\times 35$ . B. *Lagaroceras anomalum*,  $\times 35$ .

Fig. 8.—*Lagaroceras pulchellum*,  $\times 35$ .

long as the face is deep; they are all darkish orange, except that the upper half and the tip of the 3rd joint are blackened; this joint is about  $1\frac{1}{2}$  times as long as the 2nd, which

is itself rather unusually long; arista white and closely pubescent as usual, with the smooth basal joint yellow. The face is shining black, with silvery lines from the antennal bases to the mouth and with silvery lower eye-margins; palpi black.

Thorax: the dorsum is finely granulated; the general ground-colour is dark greyish, with the following black marks:—a broad median line vanishing about halfway, a very fine black line running down the centre of each of the rather obsolescent furrows; beyond this a broadish line from just in front of the callus to the side of the scutellum, interrupted by the grey ground where the cross-suture should be; last d. c. well developed; pleura shining black, with oblique row of three pale yellow spots—a triangular one just behind the humeral callus, a sloping one on the mesopleura, a horizontal one above the mid-coxa. Scutellum pale orange, nearly flat, hairless, with long crossed terminal bristles and small accessory ones beside the main ones and close to them.

Wings clear, with brownish veins; the venation is not quite as given by Becker for *megalops* (I., tab. iii. fig. 47); the 2nd vein is quite parallel to the 3rd all the way, and the distances between the ends of 2 to 3 and 3 to 4 are nearly equal.

Legs orange; femora progressively more infusate from front to hind; last tarsal joints dark.

Abdomen entirely deep dull black, smooth.

Size (ex. antennæ)  $3\frac{1}{4}$  mm.

Cam. Coll., Durban (*F. M.*).

To the section with dark and rather rugose scutellum belong two species. One of these will pass for *L. longicorne* of Thomson (Eug. Resa, p. 604). It agrees quite well with what would be a dark form of the species, though not so well with Becker's description (I., p. 108). The remarkable antennæ are even longer than may be inferred from the description; the thorax can be described as black, rather rugose, with three narrow, smoother, grey stripes; the scutellum like thorax, centrally black, with the sides orange.

It is possible that we have a new species here, but as there is but the single specimen, it is left provisionally in this species. Thomson's species was from China, this is from S. India.

Size (ex. antennæ) nearly 3 mm.

Bur. Coll., Coimbatore, Madras Presidency.

The following is a second species of this section ; it occurs also as a single specimen which, like *L. anomalum*, has a relatively stout antenna—in fact, the antenna is practically as shown in fig. 5 (p. 45).

*Lagaroceras infuscatum*, sp. n.

Head (top view):—Frons all palish ochreous brown, dull and black-haired, the triangle shining dark orange-brown and of peculiar shape; the basal part is about  $\frac{5}{6}$  as broad as the vertical cross-breadth; it continues normally along the frons, but about midway is suddenly constricted, and then continues like a narrow spear-head to the antennal base; each side of the constricted point is a yellow raised spot on the triangle; the surface is somewhat variegated in striæ and the middle area is rather darker than the rest; just at the hind eye-angles occur the usual pale spots carrying the vertical bristles. The f. o. b. small, but distinct. Hind head all black. Side-view:—Frons a little prominent, covering the antennal base, brown; face-outline nearly linear, if anything slightly concave, from antennæ to mouth. The total length of the antennæ is about equal to the face; the 2nd joint about half as long as 3rd, which is a little less than twice as long as broad; rounded oval in outline, all darkened except for a tiny spot of orange on the base of 3rd joint below; arista normal, white and pubescent, with smooth pale yellow base. Jowls, lower and hind, palish yellow, the former about half the depth of 3rd joint. Palpi black. The face is darkened with a narrow emarginate paler mouth-margin; the eyes have short silvery margins.

Thorax: dorsum black and finely punctate, with three very narrow grey lines. Scutellum flattish, similar to thorax, with a dark orange median line, two terminal and one adjacent smaller bristle each side. Pleura very shining brownish black, except for a yellow stripe just below the mesopleura.

Wings with venation similar to *pulchellum*, 2nd and 3rd quite parallel, but the cross-vein is slightly sloped backwards. Halteres white, with a brown stalk.

Legs orange, the femora progressively more infusate from fore to hind pairs, the last tarsal joint darkened.

Size (ex. antennæ)  $2\frac{1}{2}$  mm.

Cam. Coll., Durban (*F. M.*).

HAPLEGIS, Loëw.

*Haplegis nitens*, sp. n.

A small form, considerably more shining than *H. tarsata*.

Head (top view):—Entirely black and somewhat shining, even on eye-borders; the triangle fairly close to eye on vertex, extending with the usual straight sides to a sharp point over antennæ, excessively shining, with the usual shallow but sharp depressed middle trough; the bordering hair-rows very indistinct. Hind head all black. Side-view:—Lower jowls dull orange and very narrow; antennæ of normal form, 3rd black and round, 2nd bright orange; arista black and finely pubescent, the longish basal joints more orange. Face fairly silvery; tongue and palpi blackened.

Thorax all entirely shining black, including the scutellum, which has two longish end-bristles; the whole dorsum has a regular clothing of very fine brown hairs; the pleura is faintly orange in some parts.

Wings clear, normal in venation, brown veins. Halteres with almost white head.

Legs entirely clear orange, including front coxa and all the tarsi.

Abdomen shining black.

Size 2 mm.

Cam. Coll., Durban (*F. M.*).

#### ELACHIPTEREICUS, Beck.

*E. bistratus*, Beck.

Specimens from Durban, Cam. Coll. (*F. M.*).

#### CAMAROTA, Meig.

(*Modo*, *Oscinis*, Latr.)

*C. angustifrons*, Bezzi.

Specimens from Durban (*F. M.*) agreeing well with Bezzi's description.

#### METAPOSTIGMA, Beck.

*M. sauteri*.

Specimens in Bur. Coll. from Coimbatore, Madras.

#### CHALCIDOMYIA, de Meijere.

This genus was described in *Tijd. v. Ent.* (vol. liii. p. 156) as a Drosophilid, the error being due to the insect possessing a remarkable bipectinate arista. Becker redescribed it in its



proper family as *Hemisphærisoma* (III., p. 47). The synonymy was given by de Meijere in Tijds. v. Ent. (vol. lvi. p. 571). In both cases the specific name selected for the type-species had been *politus*, but for some reason de Meijere changed it to *beckeri*, though both types were the same species.

*C. polita*, de Meij.

Specimens in Bur. Coll. from Taliparamba, Malabar, with the note:—"In ginger-stems attacked by *Dichocrocis*."

#### CHROMATOPTERUM, Beck.

##### *Chromatopterum lacteiventre*, sp. n.

This species has the pubescent arista of the Indian species *C. pubescens*, Becker (III., p. 82), but its facies is that of the African *C. delicatum*, Becker (II., p. 413).

Head (top view):—Frons almost entirely covered by the brilliant shining black "triangle," which has its sides contiguous with the eyes and a rounded front margin reaching to the antennal base; its sides converge slightly to the front; the only part of the frons left uncovered by it are two small, dull orange, triangular patches each side in front; the surface is broadly and shallowly depressed; the ocellar hump is slightly raised and carries chestnut-coloured ocelli. Side-view:—The semicircular eyes cover the whole, projecting beyond the face and leaving practically no lower jowls and only a small hind eye-border, which is shining black, as is the whole hind head. The antennal 3rd joint is almost orbicular, just a little longer than deep, orange on lower half, blackened on top; arista inserted basally, hair-like except for the small pale basal joint, finely pubescent; 2nd joint yellow. Face darkened orange; palpi black.

Thorax (including scutellum and pleura) all shining black, the dorsum just before the scutellum and the scutellum itself very lightly dusted with orange pollen; the rounded and slightly swollen scutellum with moderately long slightly divergent end-bristles and a few accessory side-hairs.

Wings with venation as figured by Becker (II., tab. xiii. fig. 10), but the blackening is different; the front blackening is confined to the first part of first vein, the space between it and where the auxiliary vein would be (like a long stigma), and the thickened black costa itself, from which a faint suffusion runs on to the neighbouring cell; the end spot is smaller and discrete, it touches the costa midway between

the ends of 2 and 3, but does not extend to the end of wing or down to vein 3.

Halteres with ivory-white heads.

Legs mainly orange, all the coxæ black and all femora broadly ringed with black.

Abdomen: dorsum flattened, a little longer than broad, and tapering in outline from the base; it is of a quite unique colour, being all suffused with a dense milky-blue glaze; the last segment is considerably longer than the others; beneath, the abdomen is orange; the last segment, which is bent under, is all shining black.

Size about  $1\frac{3}{4}$  mm.

Cam. Coll., Peradeniya, Ceylon (*J. C. F. Fryer*).

#### Ops, Becker.

##### *O. madagascariensis*, End.

A specimen in Cam. Coll., Durban (*F. M.*), differs from the ordinary form only in the femora being somewhat darkened.

##### *O. callichroma*, Loëw.

There are two specimens of this species—the one in Bur. Coll. from Nyasaland, in which the abdominal cross-bands are rather weak and indefinite. The other is a very bright and shining form, which might be taken as a subspecies. It is a little larger, and the “triangle” covering nearly all the frons is very deep excessively shining black instead of being shining brown. The abdominal markings are also very clear and distinct; they consist of the following on the yellow background:—1st segment with very short central bar; 2nd arched bar with the springings situated basally; 3rd broad, only leaving narrow hind margin yellow; 4th median, of half total breadth of segment; the pointed 5th has a narrow basal band.

A specimen in Cam. Coll., Durban (*F. M.*).

##### *Ops nigra*, sp. n.

The whole of head and thorax entirely shining black, except for the orange antennæ and bright yellow scutellum. The vertical triangle does not cover the whole of the frons, but leaves eye-margins narrowly widening right from the vertex.

Wings quite normal, clear.

Legs orange, with coxa black ; femur very dusky except at tip. Knobs of halteres whitish orange.

Abdomen orange, with dark bands somewhat similar in form to last species, but all of them broader in proportion and less well demarcated.

Size 2 mm.

Cam. Coll., Mozambique (*F. M.*).

#### CHLOROPISCA, Loëw.

There are two single-specimen species—one resembling *obscura*, but with a rounder head, the other like a true *Chlorops*, but with somewhat flattened scutellum. It is not advisable to describe from these single specimens.

#### CHLOROPS, Meig.

*C. contribula*, Loëw.

Cam. Coll., Durban (*F. M.*).

*C. lævigata*, Beck.

Cam. Coll., Durban (*F. M.*).

#### *Chlorops zeylanica*, sp. n.

There is one species which will not accord with any of Becker's species in the Indian fauna. It has a somewhat exceptionally prominent head (see fig. 9) and belongs to the section with fine white arista.

Fig. 9.

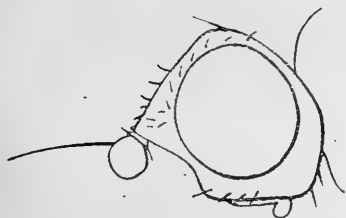
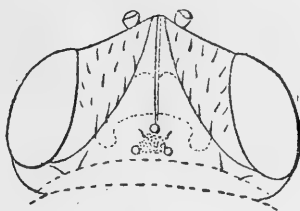


Fig. 10.



*Chlorops zeylanica*,  $\times 30$ .

Head (top view):—Frons (fig. 10) dull pale ochreous yellow covered with black hairs ; the triangle very large, with its boundary well defined nearly up to the vertex, but there less so ; it extends to the extreme front, with slightly

concave sides bordered with hair-lines, and it is the same colour as the frons but shining and suffused across the middle with pale brown, as shown by the dotted boundary-line in the figure; the ocellar spot is black; a very distinct but narrow furrow runs from front ocellus right to edge of frons. Hind head broadly black, with pale yellow bordering stripes starting from the vertical bristles. Side-view as in fig. 9; all yellow, the haired frons more orange, rest quite bare except for a few oral hairs. Antennæ with yellow basal joints, deep black orbicular third; arista white, basal joints a little suffuse, pubescence very fine. Face all pale yellow; palpi pale, but just perceptibly infuscate outside at tip; tongue yellow.

Thorax: dorsum moderately shining yellow, with black hairs; three broad black stripes, the middle one beginning on neck and extending to scutellum, the side ones abbreviated in front but meeting the middle one behind, so that they form an almost uninterrupted band on hind dorsum; small side-lines above the wings run into the main pair; humeri pale yellow. Pleura pale yellow; a shining oval black spot on the lower front angle of the mesopleura, the usual black triangle over the middle coxa, and a smallish black oval spot over the hind coxa.

Wings normal, clear, thick-veined; in one of the two specimens both the hind cross-veins are broken in the middle. Halteres bright whitish yellow, with darkened stalk.

Legs entirely yellow except that the front tarsus and last joints of the others are very faintly infuscate.

Abdomen: dorsum all brown-black, slightly shining, the hind margins of all segments but last very narrowly yellow, the last broadly so; venter paler.

Size (ex. antennæ)  $3\frac{1}{2}$  mm.

Cam. Coll., Peradeniya, Ceylon (*J. C. F. Fryer*).

#### PARECTECEPHALA, Beck.

##### *Parectecephala varifrons*, sp. n.

A species in the Cam. Coll. is best assigned to this genus; the triangle is rather longer than normal according to the descriptions of the known species.

Head (top view, fig. 12):—Frons about  $2\frac{1}{2}$  times as broad as one eye and about  $1\frac{1}{5}$  times longer than broad, projecting about  $\frac{1}{3}$  its length beyond a line touching the eyes in front; eye-margins parallel, the projecting forehead narrowing a little and ending in a broad pointed tooth overhanging the

antennal pits; frons bright dull orange, with small scattered black hairs; the triangle has its base about  $\frac{5}{8}$  the breadth at vertex; the bounding lines are nearly straight, a little raised, very narrowly yellow, and meet just beyond the level of the eyes; they continue nearly to the front in a shining yellow stalk; inside these narrow lines the triangle is mainly shining chestnut, but is variegated by lighter colours,

Fig. 11.

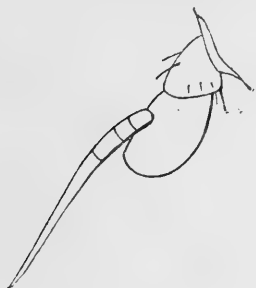
*Parectecephala varifrons*, sp. n.,  $\times 50$ .

Fig. 12.

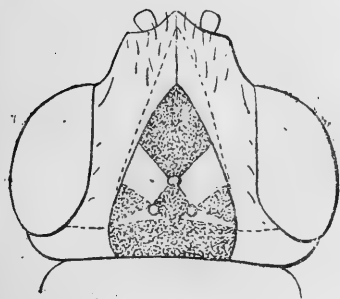
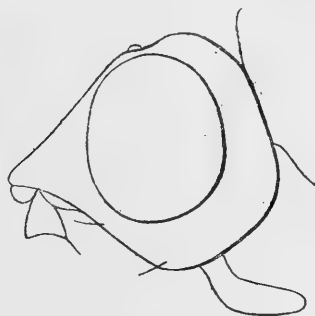


Fig. 13.

*Parectecephala varifrons*, sp. n.,  $\times 40$ .

so that the most prominently visible chestnut part is a rhombus extending from the triangle's tip to the front ocellus; this area is also very shallowly hollowed out; the lighter parts consist of (1) a pair of oval dull brightish yellow spots each side of the ocellar area, and extending thence right to the sides of the triangle; (2) two more orange and

more shining spots extending from hind ocellus to the outer angles of the triangle. The hind head is orange except for a large black patch extending from the base of the triangle. Side-view (fig. 13):—All pale whitish yellow, the side of frons orange; eyes very nearly circular; jowls about depth of 3rd; face somewhat concave; antennæ as fig. 11, but the arista for its last  $\frac{2}{3}$  is very faintly white pubescent, not bare as figured, 3rd joint orange with blackened tip; tongue and palpi yellow. Face whitish, unkeeled, but depressed, the actual facial ridges being marked with a narrow pale grey line; antennal pits well marked with dark shining chitinous edges.

Thorax: dorsum dull palish orange; a broad black central stripe from neck to end of scutellum—this is very intense up to about the middle of the dorsum, then gets much fainter, till it is very faint on the scutellum; each side is another uniformly black line, rounded and abbreviated front and back, and diminishing that way in breadth; below is another very thin blackened line extending forward from just above the wing for about  $\frac{2}{3}$  the pleural length. Scutellum (as above) suffused centrally, sides orange, not flattened, a little hairy, pair of terminal bristles; metanotum darkened; the pleura all rather shining pale yellow, with a small elongate spot.

Wings normal, clear, with brown-orange veins, the distance between cross-veins about equal to the last part of 5th; halteres with whitish knobs.

Legs long, all yellow except for the last two darkened tarsal joints.

Abdomen shining brownish orange, with very narrow pale segmental margins; venter paler.

Size  $4\frac{1}{2}$  mm.

Cam. Coll., Durban (*F. M.*).

#### PEMPHIGONOTUS, gen. nov.

In the Bur. Coll. are three specimens (1 ♂, 2 ♀) of a remarkable insect from Melville Island which exhibits marked sex-dimorphism.

Characters common to both sexes:—Texture horny, macrochaetes quite absent, though body hairy; scutellum very large, swollen, standing in profile well above the thoracic level (see fig. 14), with a flattened area of different texture; abdomen oval and flattened; wings with very long discal cell (see fig. 14), the auxiliary and anal veins just visible as "shadows" of veins; legs long; antenna like that

of a true *Chlorops*; the triangle narrow and ill-defined, with a better-defined narrow central line, only differentiated by shine from the rest of frons.

The male has a remarkable arch in the first part of the costa, which carries a fringe of very long hairs; the mid-femur and tibia are also clothed with abundant long tangled hairs.

Fig. 14.

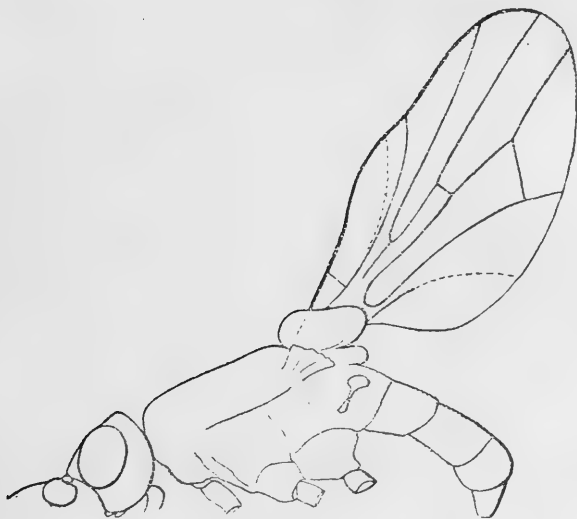
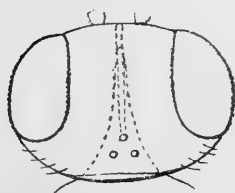
*Pemphigonotus mirabilis*,  $\times 12$ .

Fig. 15.

*Pemphigonotus mirabilis*,  $\times 22$ .

*Pemphigonotus mirabilis*, sp. n.

The insect is all red-orange, slightly darkened in various places except where otherwise mentioned.

♂.—Head (top view, fig. 15):—Frons bare, dull except for the very narrow redder mid-line extending from ocellus to forehead and the narrow ill-bounded main triangle; no eye-margins; hind head hairy at upper corners behind eyes. Side-view (fig. 14):—Antennæ and palpi clear yellow; arista hair-like, pale; tongue fleshy and hooked at tip. In front the face is wide, with no keel except a tiny bar between antennæ; margin of mouth arched.

Thorax bare on dorsum, which is flattened and dull except for a central shining line extending to the shining base; the sides above the notopleural suture and all the pleura are abundantly clothed with long pale hairs. Scutellum enormously swollen both sideways and upwards, smooth except for an extraordinary flattened area on the disc, which is slightly dimpled; the base towards thorax has two large blackened areas with a pale line between; it is hairy, with pale hairs, which are longest and regular on the margin; notopleura smooth.

Wings as fig. 14, the costal elevation from base to 1st vein with a row of long, dark, silky hairs; the whole surface much suffused except a rather narrow lower margin from axillary angle to near the end of the 5th, and again from beyond that end to just across the 4th.

Halteres practically white.

Legs long, hairy, all pale orange except for a slight suffusion on the front tibia and the darkened tarsi; all the tarsi somewhat swollen. The middle femur and tibia with abundant long pale hairs.

Abdomen flattened, long-oval, the maximum breadth being about twice the thoracic breadth.

The ♀ differs as follows:—Thorax not so dull and not flattened; wings with no costal elevation, the whole costa being very gently curved in a continuous manner; no long hairs on costa; no long hairs on middle legs.

Size about 5 mm.

Bur. Coll., Melville Island, N. Australia (*G. F. Hill*).

#### BATHYPARIA, gen. nov.

Becker describes a genus *Euryptaria* (III., p. 84) which occurs in Formosa; it has very deep jowls, quadrate 3rd antennal joint, and is covered with white hairs. Among the Durban species there are several specimens of a very handsome small Chloropid that have the above characters,



especially the bright silvery clothing, and even a faint central wing-cloud, in common with Becker's species; but they differ greatly in that the eyes are long-oval and the antennæ are smaller. The thorax in the species represented is black and not striped, and scutellar bristles are present. They must form the African equivalent of the Asiatic genus.

Head (see figs. 16 & 17):—The facial and frontal tangent-planes meet at about  $120^{\circ}$ ; eyes long-oval, with axis nearly upright; jowls very deep, about half the depth of the long eyes; antennæ nearly as long as face, with a practically rectangular 3rd joint about twice as long as broad, and a very fine, slender, bare arista, thickened basally. Frons parallel-sided, with a long rather narrow triangle from vertex to front only just differentiated by its extra shininess from the rest of frons. Wing-venation as fig. 18, the 3rd and 4th veins just not reaching the edge.

The whole insect is covered with brilliant shining white hairs even on the frons; these are very stout and bright on the thorax and head, but less so on the abdomen. Unlike *Euryparia*, there is a pair of scutellar bristles inserted in the same manner as in *Ops*.

The palpi are quite peculiar, being rather stout, long, and spoon-shaped.

*Bathyparia præclara*, sp. n.

Head (top view):—Chestnut-brown, the triangle more shining; the silvery hairs along the triangle's border bend across it; eye-margins broad and very silvery; the verticals and ocellars white; hind head all black except just on vertex behind ocelli, where is a long yellowish stripe along the vertical ridge. Side-view:—Similar in colour, the broad hind eye-margin very silvery, as is the hind jowl. Antenna slightly darkened brown; arista pale at base. The palpi are long, spoon-shaped, and silvery grey; tongue dark. Face the same brown colour, side-ridges well developed; no median keel, so that the antennæ nearly touch basally.

Thorax: dorsum, meso- and sternopleura all shining black and punctate, covered with bright silvery-white hairs arising from the punctures; the rest of pleura bare. Scutellum bright yellow, with approximated pale terminal bristles and silvery hairs like thorax. Notopleura black and dull from very faint shagreen.

Wings (see fig. 18) clear, with brown veins; in several specimens the central part is very faintly tinged with brown. Halteres pale yellow.

Legs long, with slightly dilated tarsal joints, all covered with the fine white silky hairs; front pair all black except for orange trochanter and knees; middle with orange trochanter, black femur, the rest nearly white; hind with dark orange trochanter, femur black with pale knee, tibia pale

Fig. 16.

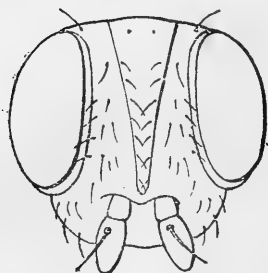


Fig. 17.

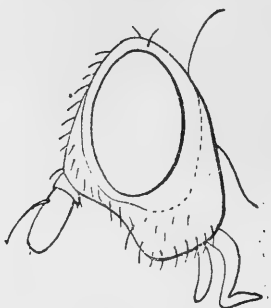


Fig. 18.

*Bathyparia præclara*,  $\times 40$ .

and more or less darkened about the middle, tarsi nearly white.

Abdomen smooth, shining black, the silky hairs evident but sparse and fine, a little longer at upper angles.

Size  $2\frac{1}{4}$  mm.

Cam. Coll., Back Beach, Durban (*F. M.*).

### III.—Some Systematic Notes on *Melolonthine Coleoptera*. By GILBERT J. ARROW.

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MR. L. PÉRINGUEY, in his "Catalogue of the Coleoptera of S. Africa" (Trans. S. Afr. Phil. Soc. xiii. 1904, p. 174), puts at the head of the genus *Sparrmannia* a species which he calls *vertumnus*, Pall. (with the names *alopez*, F., and *brunnipennis*, Cast., as synonyms), mentioning a typical form with pale testaceous colour as inhabiting the Karroo region, and a form with "light" (apparently meaning dark) chestnut elytra in Namaqualand, Bushmanland, and Damara-land. The recent Catalogue of Dalla Torre adopts this synonymy, but separates as a variety the dark form *brunnipennis*.

Dr. H. Brauns has lately sent a series of this dark form, which he has found in abundance in the Uniondale district of Cape Colony, while the light form is equally abundant in the Willowmore district, only 42 miles to the south, but separated by the range of the Zwaartberg running from west to east across the continent. Examination has proved that the two forms are quite distinct, and Fabricius's description shows that it is the dark form which is the true *S. alopez*. It was Fabricius himself who, in his Syst. Eleut. ii. p. 163, identified this insect with the *Scarabæus vertumnus* of Pallas, but with strange carelessness, for the latter is a Russian species, apparently belonging to the genus *Rhizotrogus*.

The light-coloured *Sparrmannia*, described at length by Péringuey, is therefore without a name, and I propose to call it

#### *Sparrmannia flava*, sp. n.

In addition to the pale-coloured elytra, this species differs from *S. alopez* in their more distinct and regular puncturation, in the longer tarsi of both sexes, and especially in the longer middle tarsi and more dilated hind tibiae of the male. The ædeagus is figured by Péringuey. That of *S. alopez* is much shorter and blunter. Dr. Brauns states that, while *S. flava* occurs together with *S. alopez* north of the dividing range, he has never seen the latter south of the mountains, and that no specimens of intermediate coloration are found. *S. flava* generally appears at Willowmore towards Christmas time, while *S. alopez* is later, generally appearing in January

and February. Both are nocturnal, and hide in loose soil during the day.

There is another closely similar species, of which specimens are probably included amongst those enumerated by Péringuey, and which I have wrongly determined as *S. vertumnus* in Denkschr. Med. Nat. Gesellsch. xiii. 1908, p. 438. I now call it

*Sparrmannia similis*, sp. n.

Pallide flava, capite, pronoto, scutello, pectore abdomineque longe et densissime lanatis. *S. flava* valde similis, sed clypeo paulo minus profunde exciso, elytris crebrius sed minus distincte punctatis tarsisque paulo minus elongatis.

Long. 22 mm.; lat. 11.5 mm.

*Hab.* S.W. AFRICA: Hereroland.

This has an extremely close resemblance to *S. flava*, but the elytra are finely and confusedly, instead of strongly and sparingly, punctured, the clypeus is acutely, but less deeply, notched in the middle, and its sides a little less rounded, and the tarsi, or, at least, the middle ones of the male, are not quite so long. The ædeagus of the male is drawn out into a tube just behind the orifice.

Upon p. 287 of his Catalogue already referred to, Mr. Péringuey recognizes two South-African species only of the genus *Asthenopholis*—*subfasciatus*, Blanch., and *crassus*, Arrow; but the species to which he has wrongly applied the latter name is evidently the true *A. adpersus*, Boh. (= *transvaalensis*, Brenske), and in *A. subfasciatus* he has included the quite distinct *A. minor*, Brenske. These four species may be distinguished as follows:—

I. Scutellum well punctured; hind tibia little dilated at the end.

- a. Scales of the upper surface long and hair-like. *subfasciatus*, Bl.
- b. Scales of the upper surface short and broad .. *minor*, Brenske.

II. Scutellum smooth or almost smooth; hind tibia strongly dilated at the end.

- c. Pronotum moderately covered with long setæ. *adpersus*, Bohem.
- d. Pronotum closely covered with oval scales .. *crassus*, Arrow.

*A. subfasciatus* seems to be confined to Cape Colony, *A. minor* to Natal, *A. adpersus* to Natal and the Transvaal, whilst *A. crassus* is known only from British East Africa. Brenske's species were determined for me by himself, and Mr. Péringuey has certainly determined them wrongly,

although he has had the assistance of type-specimens. The genitalia of the males are quite different in the three species he has united, notwithstanding his statement.

Mr. Péringuey has founded a genus *Euronycha*, but has not included in his Catalogue the genus *Triodonta*, of which many African species are known; and as the sole character by which he differentiates *Euronycha* (a feature of the male alone) is found in *Triodonta*, they must be considered the same.

The type of *Heterochelus gonager*, F., in the British Museum is the species called by Burmeister *H. longipes*, as Mr. Péringuey has recorded upon my authority (Trans. S. Afr. Phil. Soc. xiii. 1908, p. 698); but the quite different species to which the name *gonager* was applied both by Burmeister and by himself in vol. xii. of the above work remains without any available name. I propose to call it

*Heterochelus melanopygus*, sp. n.

The two following species of South-African Hopliini were described several years ago at Professor Poulton's request, but the descriptions have remained unpublished. The insects were amongst those collected more than a century ago by the African traveller Burchell, and now in the British and Oxford Museums. The data are taken from Burchell's notebooks in Professor Poulton's possession.

*Gouna burchelli*, sp. n.

Rather large, broad, sooty black, naked above, beneath thinly clothed with black hairs and a few white scales at the sides; head broad, rather convex and rugose above, clypeus short, not angulate but bilobed; prothorax rather broader than long, strongly contracted in front, front angles acute, hind angles very obtuse, surface finely punctate, with a faint longitudinal channel; scutellum small, almost semicircular; elytra broad, faintly costate, irregularly and inconspicuously punctured; pygidium (male) large, inturned, transversely punctate-rugose; legs (male) rather long, hind ones slightly thickened, unarmed, front tibiæ tridentate, the innermost tooth rather small and distant, all the claws single and minutely cleft, but those of the hind legs hardly visibly.

Length 9 mm.; greatest breadth 5 mm.

*Locality*. Burchell's two specimens (nos. 318 and 319)

were captured on the morning of Nov. 3, 1814, at Duyker River, in the south of Cape Colony, a little to the west of Mossel Bay.

The type is one of three specimens in the British Museum derived from the Pascoe Collection. There are also four from the Fry Collection and one from the Reiche Collection. All these, as well as the two brought by Burchell, are males, and the other sex remains still unknown. The species was wrongly identified with *Monochelus spinipes*, F., by Reiche, and has a general resemblance to that insect, but its structural characters are not those of *Monochelus*. They agree with those formulated by Mr. Péringuey for his genus *Gouna*, one of those created by the dismemberment of the old *Gymnoloma*. This dismemberment is very unsatisfactory, since by a process of elimination the original genus is left without tangible differential features at all. The present form, however, is nearly related to *Gymnoloma lineolata*, the type of *Gouna*, although much larger and broader. Its comparatively large size and sooty-black surface render it easily recognizable. I at first suspected that the absence of scales from the upper surface might be due to age; but the specimens are in general well preserved, and, as all agree in being smooth on the upper surface, they are evidently in their natural condition.

*Dicranocnemus burchelli*, sp. n.

Fuscous, with the elytra and legs reddish. Rather elongate, the thorax distinctly longer than wide and not gibbous. Clypeus parabolical, the front margin very slightly reflexed and with scarcely visible angles. Upper surface of the head uniformly finely rugose and pubescent. Prothorax moderately convex, the sides regularly rounded and converging forwards. Front angles acute, hind angles obsolete.

♂. Prothorax finely rugose and densely clothed with rather short tawny pubescence, which changes into scales at the posterior margin. The median sulcus is deep behind, but vanishes beyond the middle. The scutellum is clothed with elongate whitish scales and the elytra with round scales varying in colour from chocolate to pale yellow, the light ones forming a median longitudinal stripe which is broadest near the shoulder, a sutural stripe broadest at the apical end, and a quadrate patch between these. The pygidium and propygidium are densely covered with orange scales, with a darker band at the base of the former. The claws of the middle feet are without a basal appendage.

Length 5.5 mm.

♀. The prothorax is without a median sulcus. It is not finely rugose, but strongly punctured, and clothed with greyish hair, longer but less dense than that of the male. There are no scales. The elytra are more thinly clothed with decumbent setae of an almost uniform tawny colour.

Length 4.5 mm.

*Hab.* Burchell's eight specimens, all of which are accounted for, were captured in flowers, five of them at Uitenhage (Nov. 28 and Dec. 1, 1813), and two between Kra Ka Kamma and Van Stade's River (Feb. 7, 1814), near (S.W. of) Uitenhage. Two from each locality are in the British Museum, but there is no means of associating these specimens with their precise data.

Types (♂ and ♀) in British Museum.

The description is based upon nos. 1303 and 1305 in the British Museum. The specimen numbered 1308 is rather smaller and shorter, and may possibly prove to be distinct; but it is most likely only an aberrant individual of the same form.

From the description, this species must be very nearly related to *D. hypocrita*, Péringuey, which has on each elytron two discoidal bands of pale scales coalescing at the middle, whereas only one is present in our form. In the female no pattern is traceable. A male and female of the species were compared by Mr. Guy Marshall and Mr. Péringuey with the Péringuey type at Cape Town and the ♀ (293) named *Heterochelus longipes*, Burm., the ♂ (294) *Dicranocnemus squamosus*, Burm. Both, however, show the form of front tibia distinctive of *Dicranocnemus*, while *D. squamosus* is characterized by a peculiar formation of the middle claws of the ♂ which is absent here. *D. burchelli* is one of the very numerous species of this group of which the sexes are quite dissimilar, so that, in the absence of sufficient evidence, they are frequently associated wrongly. The question has been settled for us in the present instance by Burchell. Four males and four females were taken by him, and of these one of each given to the British Museum were placed on the same pin, showing his conclusion that they belonged to a single species. It will be seen in the above description that, in addition to a difference of shape, the elytra of the male are decorated with orange scales, with a paler sutural patch and longitudinal stripe upon each, while the female is uniformly clothed with grey hair. Hence it is not surprising that, in the absence of direct evidence, they should have been assigned to different species, and even different genera.

Both generic and specific names of Blackburn's *Neolepidiota obscura* are redundant, the insect being a common Indian species, *Holotrichia serrata*, F., of which an old specimen in bad condition and of unknown origin unfortunately fell into Blackburn's hands. It is now in the British Museum.

I believe *Lepidiota bovilli*, Blackb., to be identical with *L. rothei*, Blackb. In spite of a careful comparison of his types, I am quite unable to detect the differences mentioned by him.

### NEMATOSERICA, gen. nov.

Corpus nonnihil elongatum. Mesosternum haud productum, sat latum. Pedes graciles, tibia antica lata, bidentata, postica modice angusta, fortiter spinosa, tarsorum posticorum articulo primo quam secundum duplo longiori. Ungues profunde fissi, parte interna brevi et lata. Antennæ 10-articulatæ, clava (♂) quadri-articulata, longissima, lamellis æqualibus; (♀) triarticulata. Clypeus vix angustatus, margine antico reflexo, subtiliter sinuato, superficie anteriori haud lato. Oculi haud magni, remoti. Prothoracis latera postice sinuati, angulis posticis acutis. Elytrorum margines postici arcuati, ad suturam depressi.

### *Nematoserica cærulea*, sp. n.

Cærulea vel viridi-cærulea, sericea, clypeo tibiis tarsisque nitidis, antennis nigris; modice elongata, convexa, capite, corpore subtus pygidioque pallide setosis, elytrorum lateribus fortiter nigro-setosis, clypeo parce punctato, margine valde reflexo, antice subtiliter sinuato; pronoto parcissime punctato, lateribus bisinuatis, angulis posticis acutis, paulo productis, basi utrinque late impresso; elytris fortiter sulcatis, sulcis sat vage punctatis, apicibus separatim arcuatis, parte postica ad suturam depressa, corpore subtus opaco, grosse setoso; pygidio sat fortiter punctato. Long. 5-5.5 mm.; lat. max. 3-3.5 mm.

*Hab.* BORNEO (Sarawak): Puak (*G. E. Bryant*, April, May).

Type in the British Museum.

This beautiful little insect is chiefly remarkable for the length of the 4-jointed antennal club of the male, which is relatively longer than in any other species of *Sericinæ* known to me. The four lamellæ are of equal length—at least five times as long as the foot-stalk—and little shorter than the elytra. The bright blue or greenish-blue colour is also, so far as I know, unique. The upper surface is silky and sub-opaque, with the clypeus alone shining, the margin of the



latter broadly reflexed, the front margin very gently excised, and a row of stiff bristles traversing the middle from side to side. The eyes are rather small and far apart. The lateral margins of the prothorax are distinctly sinuated in their posterior half, the hind angles a little produced and acute and the base impressed on each side. The elytra are sulcate and the sulci contain rather coarse but shallow punctures.

The genus is apparently related to *Teraserica*, which I do not know, and which has been described from the male alone, the antenna of which has the last four joints rather long but much less elongate than in the present insect. This has not the forehead narrow and the eyes very large and prominent, as in *Teraserica*. The strongly bisinuated sides of the prothorax and acutely produced hind angles are very characteristic, and another peculiarity which, so far as I know, is not found elsewhere is in the shape of the elytra. These are separately rounded at their hinder margins, with the sutural angles extremely blunt, so that a wide angle is formed and a considerable part of the abdomen exposed. The peculiar appearance, however, is chiefly due to the fact that this part of the elytra is strongly depressed along the suture.

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IV.—*Descriptions of New Pyralidæ of the Subfamilies Epipaschianæ, Chrysauginæ, Endotrichinæ, and Pyralinæ.*  
By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Concluded from vol. xviii. p. 373.]

(26) *Pyralis nigriciliialis*, sp. n.

♂. Head and thorax creamy white tinged with purplish red, especially the tegulæ; antennæ purplish red; abdomen creamy white mixed with purplish red and dorsally banded with black except at base and extremity. Fore wing creamy white mixed with purplish red, the basal area suffused with black except at base of inner margin, the costa black, rather diffused towards apex; antemedial line defining the black area, creamy white slightly defined on outer side by purplish-red and black scales, excurved below costa; the medial part of costa with three white points; a round white spot defined by purplish red at upper angle of cell, another below the lower angle conjoined to a patch of confluent annuli beyond the lower angle, and another annulus on vein 1; postmedial line white defined on each side by purplish red, oblique to discal fold, then slightly waved; cilia black mixed

with some purplish red. Hind wing creamy white mixed with purplish red, the basal area suffused with black; an oblique slightly sinuous white antemedial line defined on outer side by purplish pink and some black scales; a white patch defined by purplish red and with purplish-red point in centre at lower angle of cell; postmedial line white defined on each side by purplish red and some black scales, waved; an interrupted purplish-red line with some black scales on it before termen; cilia black mixed with some purplish red. Underside purplish red; fore wing with the costa black with white points on it to beyond middle; hind wing with waved white postmedial line defined by deeper purplish red.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂; BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂ type. *Exp.* 16 mm.

(2c) *Pyralis trifolialis*, sp. n.

♂. Head, thorax, and abdomen white mixed with purplish red, the antennæ and tegulæ purplish red, the abdomen irrorated with some blackish scales; sides of frons and palpi blackish, the latter with the extremities of 2nd and 3rd joints white; fore legs blackish, the tarsi ringed with white; pectus, mid and hind legs, and ventral surface of abdomen white tinged with red-brown. Fore wing creamy white mixed with purplish red and irrorated with a few black scales, the terminal area more suffused with purplish red; antemedial line white defined on each side by purplish red, slightly sinuous, a small white spot defined by purplish red on its outer side at vein 1; the medial part of costa black with four white points on it; a small white spot with purplish-red annulus at upper angle of cell, others below the lower angle of cell and on vein 1, and a trifoliate patch beyond lower angle of cell; postmedial line white defined on each side by purplish red, expanding at costa, excurved to near termen at middle, and ending at tornus; cilia fuscous black with a fine white line at base. Hind wing with the basal area white mixed with black and some purplish red, the medial area purplish red irrorated with black especially towards inner margin, the terminal area purplish red mixed with whitish and black; a slightly sinuous white antemedial line defined on each side by blackish; a figure-of-eight-shaped white discoidal spot defined by blackish and with black points in its upper and lower parts; postmedial line white defined on each side by blackish, waved, excurved between veins 6 and 3; cilia fuscous black with a fine white line at base. Underside whitish suffused with red-brown; fore wing with the costa black with white points on it to beyond middle; hind wing with the postmedial line whitish and indistinct.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♂ type. *Exp.* 12 mm.

(2d) *Pyralis atrisparsalis*, sp. n.

♀. Head whitish suffused with purplish pink; thorax and abdomen purplish pink mixed with some whitish and strongly irrorated with black, the pectus, legs, and ventral surface of abdomen less strongly irrorated. Fore wing purplish pink mixed with some whitish and strongly irrorated with black, especially on basal area except towards costa; antemedial line strong, whitish defined on each side by black, oblique to submedian fold, where it is angled outwards, angled inwards at vein 1; a small blackish discoidal spot; a whitish patch on costal area towards apex, the whitish subterminal line arising from it, excurved to vein 3, then incurved; the termen purplish pink. Hind wing whitish tinged with purplish pink, the terminal half suffused with fuscous and irrorated with black towards tornus; a whitish postmedial line, excurved at middle and angled outwards at veins 3 and 2, then oblique to tornus; the termen purplish pink; cilia whitish, mixed with pink and black at tips. Underside whitish mixed with pink and fuscous; fore wing with the subterminal line indistinct, except the patch on costal area; hind wing with whitish postmedial line excurved at middle.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♀ type. *Exp.* 18 mm.

(8a) *Pyralis costinotalis*, sp. n.

♂. Head and thorax pale rufous; abdomen whitish suffused with red-brown; antennæ brownish; palpi and legs whitish suffused with red-brown. Fore wing rufous tinged with purplish red; antemedial line white defined on outer side by black, expanding into a wedge-shaped mark at costa, to which it is slightly incurved; the medial part of costa with alternating black and white points; a slight blackish discoidal spot; postmedial line white defined on inner side by blackish, expanding into a wedge-shaped mark at costa, then excurved and very slightly waved; a faint maculate brownish terminal band; a fine whitish line at base of cilia. Hind wing whitish suffused with rufous to the postmedial line except on costal area, the terminal area irrorated with brown; an oblique sinuous white antemedial line, joined at inner margin by the white postmedial line, which is excurved at middle, then slightly waved; a terminal series of small brown spots; cilia with a brown line near tips. Underside whitish suffused with reddish brown; fore wing with series of whitish and dark brown points on costa to the postmedial line; both wings with slight blackish discoidal spot and slightly waved whitish postmedial line defined on inner side by brown and excurved at middle.

(13a) *Pyralis rufibasalis*, sp. n.

♂. Head and thorax red-brown; abdomen white suffused with pale olive; legs red-brown; pectus and ventral surface of abdomen

whitish tinged with red-brown. Fore wing with the basal area rufous irrorated with red-brown, the rest of wing white tinged with olive; a small black discoidal spot; the curved postmedial line indicated by a faint olive shade on its inner side. Hind wing white tinged with olive; a diffused black patch on basal area; a small black discoidal spot; a diffused curved olive postmedial line. Underside white thickly irrorated with black-brown; hind wing with small black discoidal spot and diffused curved dark postmedial line.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♂; S. NIGERIA, Ilesha (*Humfrey*), 1 ♂ type. *Exp.* 14-16 mm.

(13 b) *Pyralis roseitincta*, sp. n.

♂. Head, thorax, and abdomen white tinged with pale red-brown. Fore wing white suffused with pale red-brown except towards the costa and termen; a curved white antemedial line with a patch tinged with rose-pink before it except at costa and inner margin; a slight red-brown discoidal spot; a sinuous white postmedial line with a rose-pink shade beyond it. Hind wing white suffused with pale red-brown except at termen; a curved white antemedial line; a white postmedial line excurved at middle and above inner margin and with rose-pink shade beyond it. Underside white tinged with rufous; hind wing with curved white postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂ type. *Exp.* 14 mm.

(16 d) *Pyralis tyrialis*, sp. n.

♀. Head, thorax, and abdomen brownish ochreous, the head, thorax, and two basal segments of abdomen suffused with purplish crimson; palpi, legs, and ventral surface of abdomen brownish ochreous. Fore wing brownish ochreous suffused with purplish crimson and slightly irrorated with dark brown; a fine curved white antemedial line; a small black discoidal spot; a white postmedial line, excurved at middle; cilia white and blackish. Hind wing brownish ochreous strongly suffused with purplish crimson and irrorated with black; indistinct curved white ante- and postmedial lines defined by black scales; a blackish terminal line; cilia blackish. Underside ochreous suffused and irrorated with brown.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 18 mm.

(16 e) *Pyralis phænicealis*, sp. n.

♀. Head, thorax, and abdomen ochreous brown with a crimson band on 2nd segment of abdomen; palpi with some dark brown at sides; fore legs suffused with dark brown. Fore wing silky ochreous brown; the costal area irrorated with some dark scales, the medial part of costa with series of black points and the terminal part of costa glossy black; two indistinct crimson sub-

basal lines; a crimson and blackish point in middle of cell and small discoidal spot; a crimson point at middle of submedian fold and bar at inner margin; a postmedial crimson point at discal fold and bar from submedian fold to inner margin; a curved diffused crimson subterminal line and a terminal band except on the black costal area; cilia deep crimson. Hind wing glossy ochreous brown; a crimson subbasal patch from cell to inner margin; a discoidal patch with oblique line from it to inner margin; a strong postmedial line somewhat excurved at middle; a subterminal band expanding into a patch at costa, and a narrow band before the ochreous terminal line; cilia deeper crimson. Underside ochreous suffused with fuscous brown: fore wing with some pale points on medial part of costa and both wings with pale curved postmedial line.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*) 1 ♀ type. *Exp.* 18 mm.

(19a) *Pyralis exumbralis*, sp. n.

♂. Head, thorax, and abdomen brownish ochreous. Fore wing ochreous; a rather diffused fuscous patch below the cell; a small black discoidal spot; a fuscous subterminal shade, not reaching the costa and narrowing to tornus. Hind wing ochreous; a subbasal patch of black irroration, the rest of wing irrorated with fuscous; a curved whitish postmedial line. Underside ochreous irrorated with fuscous; fore wing with blackish discoidal point and both wings with whitish postmedial line.

*Hab.* GOLD COAST, Bibianaha (*Spurrëll*) 1 ♂ type. *Exp.* 16 mm.

(1b) *Pyralis flavirubralis*, sp. n.

♂. Head, thorax, and abdomen purplish red mixed with some yellowish. Fore wing purplish red slightly irrorated with brownish, the medial area yellow irrorated with red and more suffused with red towards inner margin; antemedial line whitish, slightly sinuous below the cell; a blackish discoidal point; postmedial line whitish, incurved below discal fold; cilia yellowish tinged with red. Hind wing purplish red thickly irrorated with fuscous; an indistinct oblique slightly sinuous whitish antemedial line and curved slightly waved postmedial line; cilia purplish red with a fine white line at base. Underside ochreous white irrorated with red; both wings with small blackish discoidal spot.

*Hab.* TRANSVAAL, White R. (*Cooke*), 1 ♂ type. *Exp.* 18 mm.

(1d) *Pyralis perpulverea*, sp. n.

♀. Head and thorax whitish tinged with rufous and irrorated with dark brown; abdomen whitish tinged with rufous; palpi, pectus, legs, and ventral surface of abdomen rufous, the tarsi dark brown ringed with white. Fore wing rufous mixed with some whitish, especially towards inner margin and thickly irrorated with

fuscous; a slight blackish discoidal striga; cilia black mixed with some grey, a pale reddish line at base and some reddish scales at tips. Hind wing whitish tinged with rufous; cilia rufous with a fine whitish line at base and dark line near tip except towards tornus. Underside of fore wing pale fuscous brown, the costal and terminal areas rufous; hind wing whitish tinged with red-brown, the apical area rufous.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♀ type; PORT. E. AFRICA, Mt. Chipirone (*Neave*), 1 ♀. *Exp.* 22 mm.

(1 c) *Tegulifera irroralis*, sp. n.

♀. Head, thorax, and abdomen brownish grey irrorated with black; the anal tuft rufous; antennæ whitish ringed with black. Fore wing brownish grey tinged with rufous especially towards costa and irrorated with black; a series of whitish points on costa with some blackish between them except towards base; a terminal series of black bars; cilia fuscous with a fine whitish line at base and blackish line near tips. Hind wing brownish grey tinged with rufous and irrorated with black; an indistinct pale curved postmedial line defined on inner side by blackish; a terminal series of black strigæ; cilia fuscous mixed with grey, a fine whitish line near base and blackish line near tips. Underside of fore wing rufous irrorated with blackish, the inner area whitish; a series of white points on costa with black between them, a blackish discoidal striga, a pale subterminal line defined on inner side by blackish, angled outwards to termen at vein 3; hind wing pale rufous irrorated with blackish, a black discoidal point and postmedial line defined on outer side by whitish and excurved at middle.

*Hab.* W. AFRICA (*Dudgeon*), 1 ♀ type; S. NIGERIA, Lagos (*Sir G. Carter*), 1 ♀. *Exp.* 16 mm.

(2 b) *Tegulifera purpurascens*, sp. n.

♂. Head and thorax purplish red with a few fuscous scales; abdomen ochreous suffused with purplish red and irrorated with black, the extremity clear ochreous; palpi black at tips; pectus, legs, and ventral surface of abdomen purplish red irrorated with black. Fore wing purplish red irrorated with black; a rather irregularly waved almost medial black line defined on inner side by diffused ochreous; the medial part of costa with some whitish points with black between them; postmedial line black defined on outer side by diffused ochreous, waved, excurved between veins 5 and 2 and incurved at submedian fold; a terminal series of black points. Hind wing ochreous suffused with purplish red and irrorated with fuscous; traces of a curved blackish antemedial line and a distinct curved postmedial line; a terminal series of black points. Underside ochreous tinged with purplish red; both wings with small black discoidal spot and curved postmedial line.

*Hab.* S. NIGERIA (*Sampson*), 1 ♂ type. *Exp.* 22 mm.

(2 d) *Tegulifera elæomesa*, sp. n.

♂. Head and thorax pale olive-brown, the vertex of head and tips of patagia tinged with purplish red; abdomen pale olive-brown suffused with purplish red towards base and irrorated with some black scales towards extremity; pectus, legs, and ventral surface of abdomen whitish suffused with purplish red and irrorated with black. Fore wing pale olive-brown, the terminal area purplish red irrorated with black; a curved whitish antemedial line with a purplish-red patch irrorated with black before it from cell to inner margin; the medial part of costa with some white points with black between them; a black discoidal point; a slightly incurved white postmedial line with some black irroration before it below the cell; a fine white line at base of cilia. Hind wing purplish red irrorated with black; two curved whitish medial lines, the area between them suffused with blackish; a fine white line at base of cilia. Underside purplish red irrorated with black and mixed with whitish towards base; both wings with obscure black discoidal spots; fore wing with the postmedial line indistinct; hind wing with slightly waved, white, medial line defined on inner side by rather diffused black.

*Hab.* GOLD COAST, Aburi (*Johnston*), 1 ♂, Bibianaha (*Spurrell*), 2 ♂ type. *Exp.* 14 mm.

(2 g) *Tegulifera obovalis*, sp. n.

Head and thorax pale red with a few fuscous scales; abdomen pale reddish, the base purplish red; subdorsal black fasciæ except at base, connected dorsally on 2nd segment and on two terminal segments; pectus, legs, and ventral surface of abdomen pale reddish. Fore wing pale rufous slightly irrorated with fuscous, the ovate terminal area chocolate-brown; antemedial line whitish defined on outer side by blackish, rather oblique; a small black discoidal spot; the medial part of costa with whitish points with some black between them; postmedial line whitish defined on inner side by blackish, incurved; a fine white line at base of cilia. Hind wing red-brown with a slight purplish-red tinge; a curved whitish antemedial line defined on outer side by dark brown; a small blackish spot at upper angle of cell; postmedial line whitish defined on inner side by dark brown, rather obliquely curved; a fine white line at base of cilia. Underside whitish tinged with rufous especially in and beyond the cell of fore wing and on terminal areas of both wings, the costal areas with some black irroration; fore wing with the whitish and black points on costa extending to base, the postmedial line very slightly waved; hind wing with dark antemedial line from cell to inner margin, small discoidal spot and oblique slightly waved postmedial line.

*Hab.* GOLD COAST, Kumasi (*Whiteside*), 1 ♂, 1 ♀ type; NATAL, Durban (*Leigh*), 1 ♀. *Exp.* 24-28 mm.

(2h) *Tegulifera semicircularis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with pale red-brown. Fore wing whitish suffused with pale olive-brown and slightly irrorated with black, the semicircular terminal area deep chocolate-red and defined on inner side by an incurved white shade; antemedial line white defined on inner side by brown, rather oblique; a black discoidal spot; cilia white, tinged with reddish brown except at base. Hind wing whitish suffused with pale red-brown; two oblique dark medial lines defined by white, the inner line on inner side, the outer on outer side, the area between them rather whiter; a fine red-brown terminal line; cilia pale reddish, white at base and with some dark scales at tips. Underside whitish suffused with rufous; fore wing with black points on costa to beyond middle, a black discoidal point, the terminal area purplish red defined on inner side by an incurved white line; hind wing with oblique very slightly waved reddish-brown postmedial line.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 28 mm.

(2i) *Tegulifera tripartita*, sp. n.

♂. Head whitish tinged with red-brown; thorax red-brown tinged with grey; abdomen whitish tinged with red-brown; legs dark brown, the tarsi ringed with white. Fore wing with the basal and terminal areas dark red-brown with a greyish gloss, the medial area pale grey slightly tinged with red-brown and irrorated with dark brown; antemedial line white slightly defined on outer side by brown, excurved to submedian fold, then incurved; the medial part of costa with a series of white points with dark brown between them; a small dark brown discoidal spot; postmedial line white slightly defined on inner side by brown, slightly incurved below vein 3; cilia pale red-brown with a fine white line at base defined on outer side by a dark line. Hind wing greyish with dark red-brown irroration along vein 1 and on terminal half; an oblique brown line from upper angle of cell to inner margin at the postmedial line which is pale defined on each side by brown, curved; cilia pale red-brown with a fine white line at base defined on outer side by a dark line. Underside of fore wing reddish ochreous irrorated with brown, the terminal area suffused with red-brown, the inner area white, the basal area darker to submedian fold, the costa black-brown with series of prominent white points to the postmedial line, which is dark defined on outer side by white forming a small spot at costa, a blackish discoidal spot; hind wing whitish tinged with rufous and irrorated with red-brown except on inner area, a dark discoidal spot and curved postmedial line defined on outer side by whitish.

*Hab.* ASSAM, Khásis (*Nissary*), 3 ♂ type. *Exp.* 26 mm.

(3b) *Tegulifera ochrimesalis*, sp. n.

♀. Head, thorax, and abdomen yellow, the tegulæ tinged with



purplish pink, the abdomen suffused with purplish pink and irrorated with black except at extremity; pectus, legs, and ventral surface of abdomen ochreous yellow. Fore wing ochreous yellow tinged with purplish pink and slightly irrorated with dark scales, the medial area and termen almost clear ochreous; antemedial line yellow slightly defined on outer side by brownish, curved; a blackish point at upper angle of cell; postmedial line yellow slightly defined on inner side by brownish, slightly excurved at middle and incurved at submedian fold. Hind wing yellowish suffused with purplish pink and irrorated with blackish; waved whitish medial and postmedial lines; a terminal series of small blackish spots except towards tornus. Underside ochreous tinged with brown; both wings with indistinct pale sinuous ante- and postmedial lines defined by brownish; fore wing with slight dark discoidal spot.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♀ type. *Exp.* 20 mm.

(3 d) *Tegulifera pallidalis*, sp. n.

♂. Head and thorax ochreous tinged with reddish; abdomen ochreous faintly tinged with purplish red and slightly irrorated with brown; fore and mid legs suffused with red-brown. Fore wing pale ochreous slightly irrorated with brown, the terminal area tinged with purplish pink; a series of slight dark points on costa; a slight dark discoidal spot; a straight pale ochreous postmedial line defined on inner side by brown and on outer by the pink terminal area; a terminal series of dark points; cilia brownish ochreous. Hind wing ochreous white; a rather punctiform brownish terminal line except towards tornus; cilia ochreous, tinged with brown towards apex. Underside ochreous white; fore wing with the costal and terminal areas tinged with pinkish, some pale points on costa towards base, a small brown discoidal spot, the postmedial line indistinct, whitish; hind wing with the costa deeper ochreous, an oblique brown postmedial line from costa to discal fold.

*Hab.* UGANDA, Gondotroto (*Reynes-Cole*), 1 ♂ type. *Exp.* 20 mm.

(4 a) *Tegulifera bostralis*, sp. n.

♀. Head and thorax ochreous suffused with red-brown; abdomen ochreous irrorated with black-brown; legs suffused with red-brown; ventral surface of abdomen tinged with reddish. Fore wing with the basal and terminal areas red-brown, the medial area ochreous slightly irrorated with brown, more thickly towards costa; a pale antemedial line defining the basal area; some pale points on medial part of costa; a small black discoidal spot; postmedial line pale, oblique, slightly excurved at middle, then incurved; a terminal series of small blackish spots and a pale line at base of cilia. Hind wing ochreous tinged with red-brown, the terminal half suffused with pale red-brown; an indistinct sinuous dark medial line defined on outer side by ochreous; a terminal series of blackish bars; cilia red-brown with a pale line at base. Underside

of fore wing ochreous suffused with purplish red except on inner area, a series of whitish points on costa with dark brown between them to the oblique pale postmedial line; hind wing ochreous, the costal area and terminal half tinged with purplish red, a small blackish spot at upper angle of cell and oblique sinuous brown medial line.

*Hab.* BR. E. AFRICA, Kakumega Forest, Yala R. (*Neave*), 1 ♀ type; TRANSVAAL, White R. (*Cooke*), 1 ♀. *Exp.* 26-28 mm.

(6e) *Tegulifera metasarcistis*, sp. n.

♂. Head and thorax ochreous mixed with dark brown; abdomen ochreous; antennæ brownish; palpi dark brown irrorated with whitish; legs suffused with dark brown, the tarsi black-brown ringed with whitish. Fore wing ochreous thickly irrorated with purplish red and some black except on basal inner area; a pale postmedial line, excurved below discal fold; a terminal series of blackish bars; cilia ochreous tinged with red. Hind wing flesh-pink; a small brown subterminal spot at submedian fold; a blackish terminal line except towards tornus. Underside ochreous tinged with red; hind wing with obliquely curved red postmedial line.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 18 mm.

(7a) *Tegulifera flavicarnea*, sp. n.

♂. Head, thorax, and abdomen yellow tinged with reddish, the palpi, pectus, legs, and ventral surface of abdomen more strongly tinged with red-brown. Fore wing yellow tinged with purplish pink, especially on terminal half, and slightly irrorated with brown; the costa with series of white points with dark brown between them except towards base; a pale subterminal line, excurved from below costa to vein 2; a fine white line at base of cilia defined on its outer side by a black line. Hind wing golden yellow with a black line at base of cilia. Underside yellow, the costal and terminal areas tinged with purplish red and the former irrorated with dark brown; fore wing with series of white points on costa with black between them, a curved white subterminal line defined on inner side by blackish, a terminal series of small blackish spots; hind wing with curved white subterminal line defined on inner side by blackish.

*Hab.* BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 22 mm.

(7b) *Tegulifera flaveola*, sp. n.

♀. Head, thorax, and abdomen yellowish suffused with purplish red; palpi dull purplish red. Fore wing yellowish suffused with dull purplish red and irrorated with blackish scales, the area from middle of wing to the postmedial line more strongly suffused; a faint dark discoidal spot; the postmedial line indistinct, excurved at middle and incurved below vein 2; a terminal series of small blackish spots. Hind wing yellowish, suffused and irrorated with

dark brown to the indistinct curved postmedial line, the terminal area very slightly irrorated; a terminal series of small dark brown spots; cilia with a dark brown line through them. Underside yellow; fore wing tinged and irrorated with brown to the postmedial line, the terminal area slightly irrorated, more strongly towards costa; hind wing irrorated with brown to the indistinct irregular postmedial line, the terminal area sparsely irrorated from costa to vein 2.

Ab. 1. Wings uniformly suffused with red and irrorated with blackish; fore wing with the postmedial line hardly traceable; hind wing with it indistinct; the underside uniformly suffused with red and irrorated with black, both wings with curved slightly waved blackish postmedial line.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 3 ♀ type. *Exp.* 20-24 mm.

(7 c) *Tegulifera chromalis*, sp. n.

♂. Head, thorax, and abdomen golden yellow suffused with purplish red; palpi yellow tinged with purplish red in front towards base; fore coxæ and mid femora towards base deep purple, the fore and mid tibiæ black-brown, the tarsi black-brown ringed with whitish. Fore wing golden yellow, the basal area to just below the cell purplish red, the apical area from middle of costa to termen at vein 1 suffused and irrorated with purplish red leaving a conical almost clear yellow patch from postmedial part of costa to below vein 5, the inner area irrorated with a few red scales; some yellow points on medial part of costa; the antemedial line represented by a yellow bar from costa to median nervure; the postmedial line faint and excurved from vein 6 to 2, then incurved; cilia glossy black-brown. Hind wing golden yellow irrorated with purplish red to the postmedial line and on terminal area from apex to vein 4; an oblique curved red antemedial line joined at inner margin by the curved slightly waved postmedial line; cilia glossy black-brown except towards tornus. Underside yellow; fore wing more evenly irrorated with red, the costa deep purplish red with pale points on it to the indistinct curved yellow postmedial line; hind wing with the costal area irrorated with red, a faint curved postmedial line formed by red scales.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂ type. *Exp.* 30 mm.

(7 d) *Tegulifera ochrealis*, sp. n.

♀. Orange-yellow. Fore wing with faint traces of curved postmedial line. Hind wing rather paler.

*Hab.* MASHONALAND (*Dobbie*), 1 ♀ type. *Exp.* 20 mm.

(9 a) *Tegulifera conisalis*, sp. n.

♂. Head, thorax, and abdomen greyish suffused with mid reddish brown; fore tarsi dark brown ringed with whitish; dull

and hind tarsi whitish. Fore wing greyish tinged with red-brown and thickly irrorated with dark red-brown; an oblique whitish antemedial line defined on outer side by diffused dark brown; some whitish points on medial part of costa with dark brown between them; a small dark brown discoidal spot; postmedial line whitish defined on inner side by dark brown, slightly waved and curved to vein 2 and incurved at submedian fold; a terminal series of small dark brown spots and whitish line at base of cilia. Hind wing whitish tinged and irrorated with brown; a terminal series of small dark brown spots. Underside whitish tinged and irrorated with purplish brown, the inner areas paler; both wings with small dark discoidal spot and curved postmedial line; fore wing with the costa dark brown with white points on it to the postmedial line.

*Hab.* GERM. E. AFRICA, Dar-es-Salaam, 1 ♂ type. *Exp.* 16 mm.

(2) *Elæalis metachalcistis*, sp. n.

♂. Head, thorax, and abdomen dark red-brown; antennæ whitish ringed with brown; fore tarsi ringed with whitish, the mid and hind tarsi whitish tinged with red-brown. Fore wing dark red-brown with a cupreous gloss; a series of whitish points on costa to beyond middle and a postmedial whitish spot tinged with reddish. Hind wing golden cupreous irrorated with dark red-brown, the costal and terminal areas dark red-brown, the latter narrowing to tornus; the underside reddish ochreous, the basal part of costal area and cell mottled with reddish ochreous defining a dark brown discoidal spot, the terminal area dark brown narrowing to tornus.

♀. Fore wing with narrow whitish postmedial band tinged with reddish.

*Hab.* BR. E. AFRICA, Kikuyu Escarpment, Ibea (*Doherty*), 2 ♂, 1 ♀ type. *Exp.* 18–20 mm.

(1a) *Stemmatophora albiceps*, sp. n.

Antennæ of male with the basal joint very long.

Head ochreous white, the antennæ dark brown except the basal joint, the palpi with dark brown spot at side of 2nd joint, the 3rd dark brown with white tips; tegulæ ochreous white irrorated with some dark brown scales and dark brown at sides; thorax whitish, the patagia dark brown at sides; abdomen reddish brown tinged with grey, the anal tuft ochreous; pectus, legs, and ventral surface of abdomen dark brown tinged with grey. Fore wing dark reddish brown; triangular white ante- and postmedial patches on costa with faint slightly curved whitish lines from them to inner margin and two white points between them on costa; cilia with a fine white line at base and some whitish at tips. Hind wing dark reddish brown with curved whitish ante- and postmedial lines; cilia with a slight whitish line at base. Underside fuscous brown; fore wing with the inner area whitish, a series of ochreous-white points on costa to an ochreous-white postmedial patch with slight

line from it to inner margin; hind wing with oblique whitish postmedial line defined on inner side by darker brown.

*Hab.* N. NIGERIA, Minna (*Macfie*), 1 ♂ type, Zungeru (*Macfie*), 1 ♂, 1 ♀. *Exp.*, ♂ 14, ♀ 16 mm.

(2a) *Stemmatophora oleoalbalis*, sp. n.

♂. Head and thorax white with a faint brownish tinge; abdomen whitish tinged with red-brown and irrorated with dark brown scales; antennæ ringed with brown; pectus and legs suffused with red-brown, the tarsi dark brown ringed with white; ventral surface of abdomen dark brown towards extremity. Fore wing white tinged with pale olive and irrorated with a few black scales; a slight black mark at base of costa; the medial area black with white points on costa and defined by the diffused white ante- and postmedial lines, the former nearly straight, the latter strongly excurved at middle, then incurved, a wedge-shaped rufous patch beyond it on costa; a terminal series of faint black points. Hind wing white with a faint brownish tinge; a faint curved dark postmedial line; a terminal series of black points except towards tornus. Underside whitish tinged with rufous; fore wing with whitish points with black between them to the postmedial line, the medial area suffused with blackish; hind wing with slight dark point at upper angle of cell and rather diffused black postmedial line defined on outer side by white and excurved at middle.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂ type. *Exp.* 20 mm.

(2b) *Stemmatophora chloralis*, sp. n.

*Stemmatophora chloralis*, Longstaff, Butterfly Hunting in Many Lands, pl. ii. fig. 9.

♀. Head white; antennæ with the extreme base of shaft black; thorax white tinged with very pale blue-green; pectus, legs, and abdomen white irrorated with a few black scales, the tarsi slightly ringed with black. Fore wing white very finely pencilled with pale blue-green; a black striga from base of costa; a black point on middle of costa; an oblique black band, defined on each side by rather diffused white from costa just beyond middle to inner margin, with some white points on it at costa, expanding into a large elliptical black patch in and beyond the cell, then narrowing and again slightly expanding to inner margin; a terminal series of slight black points with a more prominent point above tornus. Hind wing white, the terminal area slightly irrorated with black scales, extending on costa to middle and narrowing to tornus; a slight fuscous mark at lower angle of cell; a terminal series of small black spots from apex to submedian fold. Underside of fore wing with prominent series of black striæ on costa from base to the postmedial band which is obsolescent.

*Hab.* ZAMBESI, Victoria Falls (*Longstaff*), 1 ♀ type, ♂ in Coll. Longstaff. *Exp.* 24 mm.

(6c) *Stemmatophora cupricolor*, sp. n.

♂. Head, thorax, and abdomen pale red with a whitish tinge, the pectus, legs, and ventral surface of abdomen whiter. Fore wing cupreous red slightly irrorated with black; a whitish postmedial line, oblique to vein 6, then sinuous; a fuscous terminal line; cilia fuscous mixed with whitish and with black line near base. Hind wing fiery red irrorated with blackish; a blackish antemedial line, oblique to submedian fold, where there is a white patch before it, then sinuous and defined on inner side by whitish; a curved white postmedial line slightly defined on inner side by blackish; cilia fuscous mixed with whitish and with black line near base. Underside of fore wing grey-brown, a slight dark postmedial line defined on outer side by whitish, oblique to vein 5, then slightly incurved; hind wing brownish white slightly irrorated with brown, a slight curved brown postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂ type. *Exp.* 26 mm.

(6d) *Stemmatophora olivotincta*, sp. n.

♂. Head, thorax, and abdomen whitish tinged with olive-brown; pectus, legs, and ventral surface of abdomen tinged with crimson. Fore wing whitish suffused with pale olive-brown; a slightly curved white antemedial line; the medial part of costa with series of white points with dark brown between them; a straight erect white postmedial line; a slight crimson terminal line; cilia bright crimson with a fine white line at base. Hind wing whitish suffused with pale olive-brown; traces of a curved white antemedial line and a more distinct postmedial line; a slight crimson terminal line; cilia bright crimson with a fine white line at base. Underside white tinged with rufous; fore wing with large patch of crimson suffusion in and beyond the cell and below lower end of cell with slight crimson suffusion beyond it between veins 5 and 2; hind wing with crimson antemedial line oblique to median nervure, the medial part of costa and a spot at upper angle of cell crimson, a strong rather diffused crimson postmedial line, the terminal area tinged with crimson towards apex and in submedian interspace.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♀ type. *Exp.* 24 mm.

(6f) *Stemmatophora hemicyclalis*, sp. n.

Head and thorax ochreous tinged with rufous and irrorated with a few dark brown scales; abdomen ochreous white irrorated with dark brown scales forming diffused dorsal bands except towards base; palpi and fore legs dark reddish brown, the latter with the tarsi ringed with white. Fore wing ochreous whitish irrorated with dark brown, the basal area suffused with red-brown, the costa dark brown with slight whitish points to beyond middle; a minute black discoidal spot; postmedial line white, incurved from costa towards apex to tornus, the semicircular terminal area suffused with

dark brown shading to red-brown at termen; a terminal series of black points; cilia greyish suffused with brown. Hind wing white irrorated with brown except on terminal area from apex to vein 3 which is faintly tinged with rufous; an indistinct obliquely curved dark postmedial line; a terminal series of small black spots; cilia tinged with brown and with a brownish line near base. Underside whitish; fore wing irrorated with brown especially on basal half, an indistinct erect dark postmedial line; hind wing with the costal area irrorated with brown, an indistinct obliquely curved dark postmedial line.

*Hab.* TRANSVAAL, White R. (Cooke), 1 ♂, 1 ♀ type. *Exp.*, ♂ 20, ♀ 22 mm.

(11 a) *Stemmatophora perrubralis*, sp. n.

♀. Head and thorax fiery rufous; abdomen yellowish tinged with rufous, the ventral surface deeper rufous. Fore wing fiery rufous slightly irrorated with dark brown; antemedial line pale slightly defined on outer side by black scales, rather oblique; a small black discoidal spot; postmedial line whitish slightly defined on inner side by dark scales, almost straight and erect; a slight dark terminal line and whitish line at base of cilia which are brown and whitish at tips. Hind wing yellowish suffused with fiery red; a curved whitish postmedial line slightly defined on inner side by red; a fine whitish line at base of cilia. Underside yellowish suffused with fiery red; both wings with faint red postmedial line defined on outer side by whitish.

*Hab.* LOURENÇO MARQUES, Shilouvane (Junod), 2 ♀ type. *Exp.* 28 mm.

(12 a) *Stemmatophora minimalis*, sp. n.

Head, thorax, and abdomen whitish suffused with pale red-brown; pectus, legs, and ventral surface of abdomen whitish irrorated with dark brown. Fore wing whitish suffused with pale red-brown and irrorated with blackish; the costa with slight whitish points with blackish between them to the postmedial line; a curved whitish antemedial line; a faint dark medial line, slightly excurved to submedian fold, then incurved; postmedial line whitish slightly defined on inner side by dark brown and slightly curved; cilia brown with pure white tips. Hind wing whitish suffused with pale red-brown and irrorated with blackish; an oblique whitish antemedial line curved inwards to costa; a straight white postmedial line; cilia brown, pure white at tips. Underside whitish suffused with reddish and irrorated with brown; both wings with curved white postmedial line.

*Hab.* CEYLON, Trincomali (Green), 1 ♂, 1 ♀ type. *Exp.*, ♂ 12, ♀ 14 mm.

(12f) *Stemmatophora excurvalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with pale red-brown and irrorated with dark brown, the last with blackish dorsal bands on two medial segments. Fore wing whitish suffused with pale red-brown and irrorated with dark brown; a narrow inwardly oblique whitish antemedial band; the medial part of costa with slight whitish points with dark brown between them; a faint blackish discoidal spot; postmedial line whitish slightly defined on inner side by fuscous, slightly incurved to discal fold, then strongly excurved to vein 2, then incurved; cilia with a white line at base, the tips fuscous and white. Hind wing whitish tinged with pale red-brown and irrorated with brown, the apical area more suffused with brown; a diffused curved whitish postmedial line; a terminal series of slight dark spots; cilia white with dark lines near base and tips. Underside white tinged with red-brown and irrorated with dark brown; fore wing thickly irrorated except on inner area, the costa with whitish points with dark brown between them to the postmedial line; a small blackish discoidal spot; hind wing with small black discoidal spot and rather diffused blackish postmedial line defined on outer side by whitish and excurved at middle.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♀ type. *Exp.* 20 mm.

(12g) *Stemmatophora postaurantia*, sp. n.

Head, thorax, and abdomen whitish tinged with rufous, the last irrorated with black on terminal half; antennæ slightly ringed with black. Fore wing whitish tinged with pale rufous and irrorated with black; a patch of black irroration at base of costal area; antemedial line black, diffused, slightly excurved at submedian fold; the medial part of costa black with white points on it; a black discoidal spot; postmedial line black, diffused, slightly incurved at discal fold and angled inwards at submedian fold; a patch of black irroration on costal area towards apex; a terminal series of small black spots. Hind wing reddish orange with a terminal series of small black spots. Underside of fore wing orange-red, the costal and inner areas whitish tinged with olive-brown, the costa with series of whitish points with some black between them to the diffused black postmedial line, slightly incurved at discal and submedian folds, a black discoidal spot; hind wing orange-red, the costal and terminal areas irrorated with a few blackish scales, an indistinct oblique postmedial line formed by blackish scales.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(13a) *Stemmatophora erebalis*, sp. n.

Head, thorax, and abdomen red-brown largely mixed with black; tarsi pale. Fore wing reddish brown very thickly irrorated with



black; a pale waved antemedial line; the medial area with series of black and pale points on costa; a black discoidal spot; a pale minutely waved postmedial line defined by black on inner side and excurved at middle; a terminal series of small black spots; cilia reddish with dark lines at middle and tips. Hind wing fuscous with indistinct blackish discoidal spot; a pale curved postmedial line; a fine black terminal line; cilia pale with diffused dark line through them.

*Hab.* GOLD COAST, Ajinak (*Dudgeon*) 2 ♂, 1 ♀ type; N. NIGERIA, Minna (*Macfie*), 3 ♂, 1 ♀, Zungeru (*Macfie*), 2 ♂, 2 ♀, Bida (*Macfie*), 3 ♀; MASHONALAND (*Dobbie*), 1 ♀. *Exp.*, ♂ 20, ♀ 26 mm.

(15 b) *Stemmatophora fusilinealis*, sp. n.

Head, thorax, and abdomen ochreous suffused with rufous, the terminal half of abdomen with black strongly mixed; fore legs black-brown, the tarsi ringed with white; mid legs suffused with black-brown, the tarsi whitish ringed with black. Fore wing ochreous suffused with cupreous red and slightly irrorated with black; a diffused curved black antemedial line; the medial part of costa with series of white points with black between them; a small black discoidal spot; a diffused black postmedial line, angled inwards at discal and submedian folds and with its outer edge minutely dentate; traces of a waved subterminal line formed by black scales; a terminal series of black striæ; cilia with blackish lines near base and tips. Hind wing ochreous suffused with cupreous red; an indistinct curved slightly waved dark postmedial line; a terminal series of black striæ; cilia with blackish lines near base and tips. Underside ochreous suffused with cupreous red; fore wing with series of whitish points with blackish between them to the postmedial line, the other markings as above.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 3 ♂, 1 ♀ type. *Exp.* 22 mm.

(5 a) *Herculia roseotineta*, sp. n.

Head, thorax, and abdomen white tinged with pinkish brown; palpi and legs suffused with red-brown. Fore wing whitish suffused with brownish pink and faintly irrorated with brownish, the costal edge whiter; antemedial line white, angled outwards below costa, then oblique; a slight brownish discoidal spot; postmedial line white, oblique; a whitish line at base of cilia. Hind wing white, the terminal half tinged with pink except towards tornus; a faint white postmedial line slightly defined on inner side by pink; a terminal series of pink points to submedian fold; the cilia tinged with pink and with whitish line at base to submedian fold. Underside of fore wing rose-red, the inner area white, the costa with series of white points with brown between them to the obliquely curved white postmedial line; hind wing white, the costal area suffused and irrorated with pink, a slight pinkish discoidal point, a

curved white postmedial line slightly defined on inner side by pink from costa to submedian fold.

*Hab.* TRANSVAAL, White R. (*Cooke*), 1 ♀, Pretoria (*Distant, Janse*), 2 ♂, 4 ♀ type. *Exp.* 22-24 mm.

(15 a) *Herculia plumbeoprunalis*, sp. n.

Head and thorax yellowish suffused with purplish red; thorax and abdomen greyish suffused with purplish red; pectus, legs, and ventral surface of abdomen purplish red. Fore wing reddish brown with a leaden-grey gloss, the costal area yellow suffused with purplish red; a slightly curved brown antemedial line defined on inner side by yellowish; a series of yellow points on medial part of costa with dark red-brown between them; a slight brown discoidal striga; the postmedial line almost subterminal, with a yellow bar from costa to vein 6, then a slight pale line excurved to vein 2; cilia yellow, deep red at base and apex. Hind wing reddish brown glossed with leaden grey; a faint pale curved postmedial line; cilia yellow, deep red at base. Underside whitish tinged with brown; fore wing with the costal area yellow tinged with red and with yellow points on costa with brown between them to the postmedial line; hind wing with curved brown postmedial line.

*Hab.* W. COLOMBIA, R. Jiminez, 1 ♀, R. Dagua, 1 ♀; VENEZUELA, Esteban Valley, Las Quiguas, 2 ♀; ECUADOR, R. Pastaza, Alpayacu (*Palmer*), 1 ♂. *Exp.* 22-30 mm.

(22 b) *Herculia perpulverea*, sp. n.

♀. Head, thorax, and abdomen brownish ochreous irrorated with dark brown; pectus, legs, and ventral surface of abdomen pale red-brown. Fore wing brownish ochreous thickly irrorated with dark brown; traces of a curved brownish antemedial line defined on inner side by diffused ochreous; postmedial line indistinct, brown defined on outer side by ochreous, strongly excurved; a fine pale line at base of cilia. Hind wing brownish ochreous thickly irrorated with dark brown; a faint curved dark postmedial line; a fine pale line at base of cilia. Underside ochreous whitish tinged and irrorated with red-brown; both wings with faint curved brown postmedial line.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♀ type. *Exp.* 24 mm.

(24 b) *Herculia griseobrunnea*, sp. n.

♂. Head, thorax, and abdomen purplish brown mixed with grey; antennæ whitish tinged with brown; mid tarsi and hind legs whitish. Fore wing purplish brown irrorated with grey; antemedial line white, excurved to submedian fold; the medial part of costa with white points with dark brown between them; postmedial line white, expanding at costa, then slightly waved and

excurved at middle; a fine white line at base of cilia followed by a brown line. Hind wing whitish suffused and irrorated with purple-brown; a curved white postmedial line; a fine white line at base of cilia followed by a brown line. Underside white thickly irrorated with brown; fore wing with white points with dark brown between them on costa to the postmedial line.

*Hab.* TRANSVAAL, Groenvlei (*Janse*), 1 ♂, Merwe (*Janse*), 1 ♂ type, Pretoria (*Janse*), 1 ♂. *Exp.* 18 mm.

(25 a) *Herculia purpureorufa*, sp. n.

♀. Head, thorax, and abdomen greyish suffused with purple-red; hind legs whitish. Fore wing deep purplish red; a curved white antemedial line expanding into a patch on costa; two white points on medial part of costa; a white postmedial bar from costa to vein 6, then a fine line excurved at middle and above inner margin and incurved at submedian fold; a white line at base of cilia. Hind wing deep purple-red irrorated with a few dark brown scales; an obliquely curved white antemedial line joined above inner margin by a similar postmedial line and both slightly excurved just below submedian fold; a fine white line at base of cilia followed by a dark brown line. Underside purple-red thickly irrorated with dark brown; fore wing with white points on costa to the postmedial line; hind wing with curved white postmedial line.

*Hab.* MADRAS, Belgaum (*Watson*), 1 ♀ type. *Exp.* 20 mm.

(26 b) *Herculia pyrerythra*, sp. n.

♂. Head, thorax, and abdomen purplish red, the anal tuft yellowish; legs irrorated with black. Fore wing deep purple-red irrorated with black, the medial area more thickly irrorated except towards costa; a curved whitish antemedial line; the medial part of costal area paler with slight white points with black between them on the costa; postmedial line whitish, expanding at costa, excurved at middle and above inner margin; cilia fuscous brown with fine white line at base and diffused whitish line at middle. Hind wing deep purple-red irrorated with black, the medial area more thickly irrorated; an oblique white antemedial line and white postmedial line excurved at middle and above inner margin; cilia fuscous brown with a fine white line at base and more diffused line at middle. Underside purple-red thickly irrorated with black; fore wing with white points on costa to the postmedial line; hind wing with the postmedial line defined on inner side by black.

*Hab.* N. NIGERIA, Zungeru (*Simpson*), 1 ♂ type. *Exp.* 16 mm.

(26 c) *Herculia lacteocilia*, sp. n.

Head, thorax, and abdomen greyish suffused with pale purplish red, the last irrorated with a few dark scales; fore legs dark brown, the tarsi ringed with whitish. Fore wing greyish tinged with

purplish red and irrorated with blackish, the terminal area suffused with fuscous brown; traces of a pale curved antemedial line; the medial part of costa with whitish points with black-brown between them, and with the costal area whiter; postmedial line whitish, oblique; cilia black-brown at base, pale yellow at tips. Hind wing purplish red irrorated with blackish; oblique slightly sinuous whitish ante- and postmedial lines approximated at inner margin; cilia black-brown at base, pale yellow at tips. Underside whitish suffused with purplish red and irrorated with black; fore wing with white points on costa to the postmedial line; hind wing with oblique white postmedial line.

Ab. 1. Hind wing brighter purplish red; cilia of both wings pure white at tips.

*Hab.* UGANDA, Toro, Mpanga Forest (*Neave*), 1 ♂, 1 ♀ type; BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂. *Exp.*, ♂ 18, ♀ 20 mm.

(32 b) *Herculia perrubralis*, sp. n.

♀. Head, thorax, and abdomen purplish red; mid and hind tarsi whitish. Fore wing deep purple-red; antemedial line black defined on inner side by whitish, rather oblique; some pale points on medial part of costa with black between them; a small black discoidal spot; postmedial line black defined on outer side by whitish, rather oblique; a terminal series of blackish points and fine whitish line at base of cilia. Hind wing deep purple-red; an oblique blackish antemedial line and similar postmedial line defined on outer side by whitish; a terminal series of slight dark points and fine whitish line at base of cilia. Underside purplish red; both wings with small black discoidal spots and oblique postmedial line; fore wing with whitish points on costa to the postmedial line; hind wing with the costal area irrorated with blackish.

*Hab.* S. NIGERIA, Itu (*Farquhar*), 1 ♀ type. *Exp.* 23 mm.

(34 a) *Herculia castaneorufa*, sp. n.

Head, thorax, and abdomen chestnut-red; antennæ whitish tinged with red. Fore wing chestnut-red; traces of a whitish antemedial line; the medial part of costa with yellow points with dark brown between them; postmedial line yellow, slightly curved, dilated at costa; cilia glossy fuscous brown. Hind wing chestnut-red with a curved yellowish postmedial line; cilia glossy fuscous brown. Underside yellowish tinged with red and irrorated with brown; fore wing with yellowish points with dark brown between them on costa to beyond middle; hind wing with oblique dark brown medial line.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 2 ♂, 1 ♀ type. *Exp.*, ♂ 24, ♀ 28 mm.

(34 b) *Herculia flavirufalis*, sp. n.

Head, thorax, and abdomen yellowish tinged with red. Fore

wing yellow tinged with fiery red and slightly irrorated with brown; traces of a yellow antemedial line; the medial part of costa with yellow points with black-brown between them; a yellow postmedial line faintly defined on inner side by brown, slightly excurved at middle; a terminal series of slight brown points; cilia glossy fuscous brown with a fine yellow line at base. Hind wing yellow suffused with fiery red; indistinct curved dark ante- and postmedial lines defined by whitish, the former on inner side, the latter on outer; cilia glossy fuscous brown. Underside yellow tinged with red; fore wing with dark discoidal point and yellowish points on costa with blackish between them to the dark postmedial line defined on outer side by whitish; hind wing with faint curved dark postmedial line.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂, 1 ♀ type. *Exp.* 22 mm.

(34 c) *Herculia ecrhodalis*, sp. n.

♂. Head and thorax pale purplish red; abdomen whitish irrorated with purplish red; antennæ whitish; pectus and legs red-brown; abdomen whitish tinged with red-brown. Fore wing whitish tinged with red and irrorated with purplish red, the terminal area suffused with purplish red; traces of a whitish antemedial line; the medial part of costa with whitish points with dark brown between them; postmedial line whitish, slightly excurved at middle. Hind wing whitish suffused with purple-red; a curved whitish postmedial line; cilia with a whitish line at base. Underside whitish suffused with red-brown; fore wing with whitish points with dark brown between them on costa to the faint pale postmedial line; hind wing with curved whitish postmedial line.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 2 ♂ type. *Exp.* 18 mm.

(34 d) *Herculia ecbrunnealis*, sp. n.

♀. Head, thorax, and abdomen greyish tinged with red-brown, the pectus and ventral surface of abdomen redder, the legs brownish with the tarsi ringed with whitish. Fore wing greyish tinged with olive-brown, the terminal area browner; traces of a whitish antemedial line; the medial part of costa with whitish points with dark brown between them; a small dark brown discoidal spot; postmedial line indistinct; dark brown defined on outer side by whitish, excurved at middle, a terminal series of black-brown points and fine whitish line at base of cilia, which are grey-brown. Hind wing greyish tinged with olive-brown, the terminal area browner; a curved brown postmedial line defined on outer side by whitish; a brown terminal line and fine white line at base of cilia, which are grey-brown. Underside ochreous suffused with rufous and irrorated with brown; fore wing with small blackish discoidal spot and whitish points with blackish between them on costa to the postmedial line; hind wing with dark discoidal point and curved postmedial line.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♀ type. *Exp.* 18 mm.

(11) *Triphassa trichotibialis*, n. n.

*Triphassa bilinea*, Hampsn. Moths Ind. iv. p. 166 (nec Moore).

*Hab.* CEYLON.

(1 a) *Sacada papuana*, sp. n.

♂. Head, thorax, and abdomen grey mixed with chocolate-brown, the tegulae mostly chocolate-brown; pectus in front and the fringes of hair on fore legs more chocolate-red. Fore wing grey irrorated with chocolate-brown, the basal area from costa to vein 1 chocolate-brown with some fiery rufous in submedian interspace; antemedial line grey, oblique to submedian fold, then inwardly oblique; a reddish-brown discoidal spot defined by grey; postmedial line grey, oblique below vein 4, a broad chocolate-brown shade beyond it; cilia dark brown mixed with grey. Hind wing purplish grey suffused with brown. Underside of fore wing purplish red, the inner area grey, the postmedial line indistinct, whitish; hind wing purplish grey, the costal area suffused with red, an indistinct curved whitish postmedial line ending at tornus.

*Hab.* BR. N. GUINEA, Dinawa (*Pratt*), 1 ♂, Ekeikei (*Pratt*), 1 ♂ type. *Exp.* 44-48 mm.

(3 c) *Sacada erythropis*, sp. n.

♀. Head, thorax, and abdomen purplish pink mixed with red-brown; pectus, legs, and ventral surface of abdomen chestnut-red. Fore wing purplish pink slightly irrorated with brown; a large elliptical crimson-red patch from below costa to above inner margin before the strongly curved fuscous antemedial line; a discoidal bar formed by fiery red and black-brown scales with a pale striga in centre; a diffused obliquely curved rufous line beyond the cell; postmedial line fuscous slightly defined on outer side by whitish, rather oblique to vein 5, then inwardly oblique, a fiery rufous shade beyond it and a chocolate-brown patch between veins 7 and 4; cilia black-brown mixed with red and with a fine whitish line at base. Hind wing dark reddish brown to the indistinct curved postmedial line, then purplish red irrorated with brown; a fine whitish line at base of cilia. Underside of both wings dark brown to the curved black-brown postmedial line defined on outer side by white towards costa of fore wing, the terminal areas purple-red.

*Hab.* S. NIGERIA, Ilorin (*Macfie*), 1 ♀ type. *Exp.* 30 mm.

(5 b) *Sacada albiocularis*, sp. n.

♂. Head and thorax greyish mixed with red-brown, the patagia dark red-brown except at base; abdomen greyish suffused with red-brown; antennae red-brown; pectus, legs, and ventral surface

of abdomen bright red-brown. Fore wing red-brown mixed with greyish, the basal part of inner area and the medial area darker greyish brown; a large fiery-red patch below the cell before the antemedial line, which is white and strongly excurved from discal fold to inner margin; a white discoidal bar with its lower extremity slightly angled outwards and a small black-brown spot on its lower part; postmedial line white, rather oblique to vein 5, then inwardly oblique and sinuous to inner margin, where it is approximated to the antemedial line, some fiery red suffusion beyond it. Hind wing whitish suffused with pale reddish; a faint curved dark postmedial line. Underside whitish suffused with pale reddish; fore wing with faint dark postmedial line oblique and sinuous below vein 5; hind wing with faint curved dark postmedial line.

Ab. 1. Fore wing with the ante- and postmedial lines confluent at vein 1 and not reaching inner margin.

*Hab.* DUTCH N. GUINEA, Fak-fak (*Pratt*), 2 ♂ type. *Exp.* 30 mm.

(9a) *Sacada nyasana*, sp. n.

♀. Head, thorax, and abdomen purple-brown; the hind tarsi with the 1st joint whitish towards base and the other joints ringed with whitish. Fore wing purple; a strongly curved fuscous antemedial line with a broad chocolate-brown shade before it; a deep chocolate-brown discoidal spot with a whitish bar in centre, a chocolate-brown shade beyond the cell, oblique below vein 4; postmedial line fuscous slightly defined on outer side by grey, rather oblique to vein 4, then inwardly oblique, the apical area beyond it chocolate-brown, its lower edge running obliquely to termen at vein 4, and a chocolate-brown shade beyond the postmedial line from vein 4 to inner margin; cilia chocolate-brown. Hind wing pale purple-brown. Underside purple; fore wing with fuscous postmedial line defined on outer side by white towards costa and oblique below vein 4; hind wing with fuscous postmedial line excurved at middle.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♀ type. *Exp.* 42 mm.

(13) *Sacada viridalis*, sp. n.

♀. Head and thorax dull apple-green; abdomen grey suffused with brown; antennæ grey-brown; pectus, legs, and ventral surface of abdomen white tinged with brown. Fore wing dull apple-green, the costal edge red-brown with a series of white points on medial area; antemedial line red-brown, sinuous to median nervure, where it is angled outwards, then oblique; postmedial line red-brown, incurved below costa, excurved to vein 4, then incurved and very slightly waved; cilia pale purplish brown with a fine white line at base. Hind wing dull apple-green, the costal area purple; an oblique purple-brown antemedial line and slightly sinuous postmedial line; cilia pale purplish with a fine white line

at base followed by a dark line. Underside whitish suffused with purple except on inner area; fore wing with the costa red-brown with white points on it to the dark postmedial line, which is excurved at middle, a dark discoidal point; hind wing with dark discoidal point and curved postmedial line slightly waved to vein 2.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♀ type. *Exp.* 30 mm.

(2 a) *Paractenia pallidirubra*, sp. n.

♂. Head and thorax whitish suffused with pale purplish red; abdomen white. Fore wing whitish suffused with pale purplish red, the costa rather darker; a small blackish discoidal spot; postmedial line indistinct, dark, rather diffused on inner side and minutely dentate on outer, slightly excurved to vein 2 and incurved at submedian fold; a terminal series of slight blackish spots. Hind wing white faintly tinged with red-brown; a rather punctiform red-brown terminal line. Underside white, the fore wing and costal area of hind wing faintly tinged with red; fore wing with slight dark discoidal spot and obliquely curved postmedial line; hind wing with faint discoidal point and postmedial striga from costa.

*Hab.* BOMBAY, Deesa (*Nurse*), 1 ♂ type. *Exp.* 24 mm.

(3 a) *Paractenia viridicostalis*, sp. n.

Head yellowish white tinged with red; thorax olive-brown mixed with black-brown and some whitish; abdomen yellowish white tinged with red, irrorated with black and dorsally banded with black; antennæ ringed with black; palpi red-brown, ochreous in front; pectus ochreous in front; legs ochreous tinged with red and irrorated with blackish. Fore wing with the costal and terminal areas olive-green slightly irrorated with blackish; some dark reddish-brown suffusion at base in and below the cell; a broad, obliquely curved, diffused dark reddish-brown fascia from near termen below apex to inner margin near base, a dark brown discoidal spot; a rather lunulate white mark from costa before apex, and broad oblique white postmedial band from vein 5 to inner margin with a dentate brown subterminal line slightly defined on outer side by white on its outer edge with a reddish shade beyond it; a terminal series of small blackish spots; a fine whitish line at base of cilia followed by small dark spots. Hind wing whitish suffused with purplish red and slightly irrorated with brown; some brown suffusion at base; a curved slightly sinuous brown postmedial line defined on outer side by white except towards costa; a terminal series of dark bars separated by white points from apex to submedian fold; cilia with a white line at base followed by a dark line. Underside whitish suffused with red and irrorated with brown; fore wing with broad dark reddish-brown shade on costal area extending to inner margin before middle, a lunulate whitish



patch from costa towards apex and oblique waved brown subterminal line defined on outer side by whitish; hind wing with rather diffused curved slightly waved dark brown postmedial line defined on outer side by whitish.

*Hab.* DUTCH N. GUINEA, Snow Mts., Setakwa R. (*Meek*), 3 ♂ type. *Exp.* 26-28 mm.

(4 a) *Paractenia sanguitincta*, sp. n.

♀. Head, thorax, and abdomen ochreous mixed with some purplish red; pectus, legs, and ventral surface of abdomen tinged with red and irrorated with black. Fore wing yellowish irrorated with purplish red, more thickly on basal costal area; an oblique diffused purplish-red postmedial line, somewhat angled inwards at submedian fold; a maculate deep red terminal line with some blackish scales on it; cilia white at base, blackish mixed with whitish at tips. Hind wing yellowish irrorated with purplish red and blackish; a faint diffused curved reddish postmedial line; a fine blackish terminal line; cilia white at base, blackish mixed with whitish at tips. Underside yellow tinged with purplish red and irrorated with black; both wings with indistinct diffused dark postmedial line.

*Hab.* GOLD COAST, Kumasi (*Sanders*), 1 ♀ type. *Exp.* 22 mm.

(5 a) *Paractenia phanerostola*, sp. n.

♀. Head, thorax, and abdomen pale glossy red-brown, the palpi and fore legs rather deeper red-brown. Fore wing pale glossy red-brown, the costa rather deeper red-brown; a faint rather diffused curved brown antemedial line; a faint brown postmedial line, excurved to vein 4, then oblique. Hind wing pale glossy red-brown; a faint diffused oblique brown antemedial line and rather more distinct curved postmedial line. Underside of fore wing whitish suffused with red-brown; hind wing whitish tinged with red-brown; both wings with curved brown postmedial line.

*Hab.* ECUADOR, R. Bobonaza, Canelos (*Palmer*), 1 ♀ type. *Exp.* 34 mm.

(5 b) *Paractenia castaneonigra*, sp. n.

Head, thorax, and abdomen chestnut-red, the last dorsally suffused with black; legs suffused with black, the tarsi black ringed with chestnut. Fore wing chestnut-red, the base and the whole wing beyond the antemedial line suffused with black-brown; antemedial line blackish, oblique to submedian fold, then angled inwards at vein 1; the medial part of costa with reddish-ochreous points; postmedial line indistinct, ochreous, very slightly waved, excurved at middle and angled inwards at submedian fold; cilia blackish at base and with some ochreous scales at middle. Hind wing glossy black-brown with a chestnut-red tinge; cilia black at base, bright yellow at tips. Underside black-brown; fore wing

with the costal area chestnut-red to the postmedial line, the costal edge black-brown with ochreous points on it, the postmedial line yellow on costal area, then indistinct; hind wing with the costal area and cell chestnut-red to the postmedial line, the inner area whitish irrorated with black-brown, a yellowish postmedial line slightly incurved in submedian interspace.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂, 2 ♀ type. *Exp.*, ♂ 28, ♀ 36 mm.

(6 a) *Paractenia sichimensis*, sp. n.

Head and thorax yellow mixed with brick-red; abdomen yellow tinged with red and irrorated with brown; legs yellow irrorated with dark brown. Fore wing yellow suffused with red and irrorated with brown, the medial area yellower with a nearly clear yellow conical patch from costa before the postmedial line and another patch below end of cell; antemedial line brown defined on outer side by yellow, excurved to median nervure, then oblique; the medial part of costa dark brown with yellow points on it; a small brown discoidal spot; postmedial line brown, diffused on outer side, inwardly oblique and somewhat incurved below vein 5; a terminal series of blackish points; a fine pale line at base of cilia followed by a dark line. Hind wing yellowish white, the termen slightly tinged with red and irrorated with brown; a terminal series of blackish points and fine pale line at base of cilia followed by a dark line. Underside yellow tinged with red and irrorated with dark brown; fore wing with the costal area suffused with brown, a small dark discoidal spot, yellower patch from costa beyond the cell, and diffused oblique dark postmedial line; hind wing with slight brown discoidal spot and curved postmedial line.

*Hab.* SIKHIM (*Pilcher, Möller*), 8 ♂, 5 ♀ type. *Exp.* 20-24 mm.

(7 a) *Bostra purpurealis*, sp. n.

Head and thorax bright purple-red; abdomen pale purple-red irrorated with brown; antennæ white above; fore tibiae white on outer side, the tarsi white. Fore wing bright purple-red irrorated with brown, the medial area tinged with fuscous, the costal edge white except towards base; antemedial line fuscous, oblique to submedian fold, then slightly incurved; postmedial line fuscous slightly defined on outer side by white and slightly incurved in submedian interspace. Hind wing whitish suffused with pale purple-red and fuscous brown; a curved fuscous postmedial line defined on outer side by whitish from costa to vein 1; cilia bright purple-red. Underside grey with pale purplish-red streaks along the veins; both wings with the costal area purple-red to beyond middle and with fuscous postmedial line; fore wing with white scales on the costa.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 3 ♂, 1 ♀ type; PORTUGUESE E. AFRICA, Mt. Chipirone (*Neave*), 1 ♂. *Exp.* 30-32 mm.

(7 b) *Bostra cænochræa*, sp. n.

Head, thorax, and abdomen pale purplish red thickly irrorated with fuscous; antennæ of male pale red. Fore wing pale purplish red thickly irrorated with fuscous, the costal edge redder; antemedial line rather diffused, black, excurved below costa then slightly incurved; a small black discoidal spot; postmedial line rather diffused, black faintly defined on outer side by whitish in male, and slightly excurved. Hind wing uniform glossy grey-brown with a purplish-red tinge. Underside greyish brown, the costa of fore wing purplish red irrorated with dark brown; hind wing with faint curved dark postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂, 2 ♀ type; TRANSVAAL, White R. (*Cooke*), 2 ♂. *Exp.* 26–30 mm.

(7 h) *Bostra pallidifrons*, sp. n.

♂. Head white tinged with pale rufous; thorax and abdomen grey-brown mixed with whitish; tibiæ and tarsi whitish tinged with brown. Fore wing dark brown mixed with grey-white; antemedial line diffused, whitish, oblique to median nervure and slightly incurved in submedian interspace; the medial part of costa with white points with black-brown between them; a small blackish discoidal spot; postmedial line diffused, whitish, incurved below vein 4. Hind wing uniform grey-brown. Underside grey suffused and irrorated with brown; fore wing with whitish points on costa with black-brown between them except at base and apex.

*Hab.* MASHONALAND, Enkeldoorn Distr. (*Miss E. S. Younge*), 1 ♂ type. *Exp.* 14 mm.

(7 j) *Bostra lignealis*, sp. n.

Head and thorax pale brownish red; abdomen whitish tinged with red and irrorated with blackish; legs whitish irrorated with dark brown. Fore wing pale red-brown irrorated with blackish; antemedial line whitish defined on outer side by blackish, almost straight; the medial part of costa with white points with some black between them; a small black discoidal spot; postmedial line whitish defined on inner side by blackish, slightly excurved at discal fold and below submedian fold; cilia with a white line at base. Hind wing pale red-brown irrorated with blackish, an oblique whitish antemedial line defined on outer side by blackish and joined at inner margin by a slightly sinuous whitish postmedial line defined on inner side by blackish; cilia with a white line at base. Underside whitish suffused with red-brown and irrorated with blackish; both wings with sinuous white postmedial line; fore wing with blackish discoidal spot.

*Hab.* BR. E. AFRICA, Nairobi (*Anderson*), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(9 a) *Bostra rusinalis*, sp. n.

♂. Head and thorax rufous with a few dark brown scales; abdomen whitish tinged with rufous. Fore wing rufous sparsely irrorated with dark brown, the basal costal area suffused with blackish; traces of a waved dark antemedial line; the medial part of costa with whitish points with dark brown between them; a small dark discoidal spot; postmedial line indistinct, dark, slightly excurved to vein 4 then slightly incurved. Hind wing whitish tinged with rufous, the termen and bases of cilia rather deeper rufous; the underside with the costal area suffused with rufous and irrorated with dark brown.

*Hab.* GOLD COAST, Appan, 2 ♂ type. *Exp.* 22 mm.

(10 a) *Bostra pallidicolor*, sp. n.

♂. Head and thorax whitish tinged with pale red and irrorated with a few dark brown scales; abdomen white faintly tinged with red and slightly irrorated with brown; palpi and pectus in front redder. Fore wing whitish tinged with purplish red and irrorated with brown, the red rather deeper on basal costal area and forming diffused streaks in discal and submedian folds; a very faint diffused dark antemedial line angled outwards at submedian fold; a black discoidal spot; postmedial line indistinct, dark, diffused, oblique below vein 4; a terminal series of minute blackish spots. Hind wing ochreous white; a terminal series of slight brown points from apex to vein 2. Underside white; fore wing with the costal area bright rufous with the costal edge white, then tinged with ochreous and irrorated with brown except on inner area; hind wing with the costal area tinged with rufous and irrorated with brown, a blackish spot at upper angle of cell.

♀. Head and thorax greyish tinged with purplish red; abdomen whitish thickly irrorated with brown; fore wing greyish uniformly tinged with purplish red; hind wing suffused with pale reddish brown; underside of fore wing suffused with brown except on costal area, the hind wing tinged with brown and with curved brown postmedial line from costa to submedian fold.

*Hab.* TRANSVAAL, Pretoria (*Distant, Janse*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 30, ♀ 26 mm.

(10 c) *Bostra dentilinealis*, sp. n.

Head and thorax whitish tinged with red-brown and irrorated with a few black-brown scales; abdomen suffused with fiery red and irrorated with black. Fore wing whitish suffused with pale red-brown, sometimes tinged with olive-green and irrorated with black-brown; an indistinct dentate blackish postmedial line somewhat incurved at submedian fold; a terminal series of black striae; cilia with reddish-brown lines near base and at tips. Hind wing whitish suffused with fiery red and slightly irrorated with brown; a curved dentate blackish postmedial line, rather diffused on inner

side; a terminal series of black-brown bars; cilia with a red line near base. Underside whitish suffused with red and irrorated with dark brown; both wings with slight dark discoidal striæ and diffused curved dentate postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂, 3 ♀ type. *Exp.* 24 mm.

(11 a) *Bostra pyrochroalis*, sp. n.

♂. Head, thorax, and abdomen bright fiery red; the antennæ blackish except at base; the frons and palpi whitish, the latter black at tips. Fore wing bright fiery red slightly irrorated with blackish, especially before the antemedial line and on terminal area; antemedial line whitish, excurved below costa, then slightly incurved; postmedial line whitish, slightly excurved beyond the cell, then slightly incurved, both the lines faintly defined by fuscous. Hind wing bright fiery red slightly irrorated with blackish, especially on apical area; faint oblique whitish ante- and postmedial lines slightly defined by fuscous and somewhat approximated towards inner margin. Underside of both wings with blackish discoidal point and curved white postmedial line; fore wing with series of white points on costa to the postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂ type. *Exp.* 14 mm.

(10 b) *Bostra flavalis*, sp. n.

♂. Head, thorax, and abdomen yellow with a faint olive tinge; palpi fuscous below; tibiæ with the spurs fuscous at base. Fore wing yellow with a faint olive tinge; antemedial line formed by slight black striæ defined on inner side by white, slightly sinuous; the medial part of costa with black and white points; a slight blackish discoidal striga; postmedial line formed by black scales defined on outer side by white, slightly excurved below costa and at middle and incurved at discal fold and below vein 3; a terminal series of black striæ; cilia with some blackish at tips. Hind wing yellowish white tinged with fuscous brown; a curved fuscous postmedial line slightly defined on outer side by white; a terminal series of blackish striæ; cilia with a slight brownish line near base. Underside of fore wing suffused with brown except on inner area to the postmedial line; hind wing irrorated with brown; a curved dark postmedial line.

*Hab.* FORMOSA, Kanshirei (*Wileman*), 2 ♂ type. *Exp.* 16 mm.

(19 c) *Bostra phænicocraspis*, sp. n.

Head, thorax, and abdomen olive-yellow, the last tinged with crimson at extremity; antennæ whitish tinged with brown; fore and mid tibiæ and the hind tibiæ at extremity crimson, the fore legs and ventral surface of abdomen except towards base irrorated with brown. Fore wing olive-yellow irrorated with a few red-brown scales; a faint red-brown antemedial line, oblique to sub-

median fold; the medial part of costa with whitish points with blackish between them; a slight brown discoidal striga; postmedial line slight, brown, somewhat oblique to vein 4 and slightly ex-curved above inner margin; a terminal series of black bars; cilia deep crimson at base, then paler crimson with the tips blackish to vein 3. Hind wing olive-yellow; an obscure line formed by brown scales from lower angle of cell to inner margin and a similar slightly curved postmedial line; the terminal area irrorated with a few brown scales; a terminal series of black striæ; cilia deep crimson at base, paler crimson at tips. Underside of fore wing crimson irrorated with black except on costal area to the post-medial line and below vein 3 to termen, the costa with series of quadrate black spots to the postmedial line which is black, ex-curved from below costa to vein 3, then erect, a black discoidal point; hind wing suffused with crimson and irrorated with black to the postmedial line and on apical area, the termen then narrowly crimson, the postmedial line blackish, obliquely curved to vein 2, then sinuous.

*Hab.* CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂, 2 ♀ type. *Exp.* 22 mm.

(19 e) *Bostra phænicoxantha*, sp. n.

♂. Head, thorax, and abdomen whitish suffused with dull purplish red; antennæ ringed with brown; fore legs crimson; pectus, mid and hind legs, and ventral surface of abdomen ochreous. Fore wing brilliant crimson with a yellow medial band except on costal area, defined on inner side by the faint curved crimson ante-medial line and on outer by the similar postmedial line ex-curved at middle; a blackish terminal line except towards tornus. Hind wing brilliant crimson, with a broad yellow medial band defined on inner side by the slight curved crimson antemedial line and on outer by the similar postmedial line ex-curved at middle; a black terminal line except towards tornus; cilia whitish at tips. Under-side with the crimson paler and duller.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 2 ♂ type. *Exp.* 20 mm.

(21 a) *Bostra maculilinea*, sp. n.

Head, thorax, and abdomen white mixed with cupreous red and irrorated with black, the abdomen suffused with black towards extremity; antennæ white ringed with black; fore tibiæ and the tarsi black ringed with white. Fore wing cupreous red thickly irrorated with black; some white at base of inner margin; ante-medial line white defined on outer side by rather diffused black, slightly waved; the medial part of costa with white points with blackish between them; postmedial line white defined on inner side by diffused black and forming a small white spot at discal fold and larger spot in submedian interspace, slightly waved, ex-curved at middle and incurved in submedian interspace; a black terminal line; cilia white with blackish lines at base and middle

and at tips. Hind wing white tinged with red-brown and irrorated with fuscous; a curved slightly sinuous white postmedial line; a black terminal line; cilia white mixed with fuscous and with black line near base. Underside of fore wing whitish suffused with fuscous, the costal area chestnut-red to the white postmedial line, the costal edge fuscous with white points; hind wing white tinged with red and irrorated with fuscous, a white postmedial line defined on inner side by black, slightly incurved at discal fold, then excurved.

Ab. 1. Fore wing with the antemedial line obsolescent towards costa, the postmedial line obsolescent at middle.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 8 ♂, 4 ♀ type. Exp. 14-18 mm.

(21 b) *Bostra ignirubralis*, sp. n.

♂. Head, thorax, and abdomen fiery red, the last slightly irrorated with blackish; antennæ whitish tinged with red; palpi and legs deeper red with some blackish mixed, the mid and hind tarsi whitish tinged with red. Fore wing fiery red; antemedial line brown defined on inner side by whitish, very slightly curved; a slight blackish discoidal spot; the medial part of costa with slight white points with black between them; postmedial line fuscous brown defined on outer side by whitish, very slightly curved and slightly incurved at submedian fold; cilia with some fuscous mixed. Hind wing fiery red; an oblique dark antemedial line defined on inner side by whitish, met above inner margin by a curved dark postmedial line defined on outer side by whitish; cilia with some fuscous mixed. Underside paler red irrorated with fuscous brown; fore wing with the inner area whitish, the costal edge dark brown with white points to the indistinct dark postmedial line, a slight dark discoidal spot; hind wing with faint curved dark postmedial line.

Hab. CEYLON (*Mackwood*), 1 ♂ type. Exp. 32 mm.

(5) *Zitha fulviceps*, sp. n.

Head fulvous yellow, the antennæ dark brown ringed with whitish, the palpi suffused with brown except above; thorax dark brown; abdomen, pectus, and legs yellowish suffused with brown. Fore wing glossy fuscous brown; an indistinct blackish discoidal spot; postmedial line indistinct, blackish, excurved below costa and slightly incurved below vein 4. Hind wing glossy fuscous brown. Underside fuscous brown; both wings with indistinct curved dark postmedial line.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 2 ♂, 1 ♀ type; PORTUGUESE E. AFRICA, Mt. Chipirone (*Neave*), 1 ♂. Exp. 16 mm.

Genus *PHRYGANOMIMA*, nov.

Type, *Phryganodes noctifer*, Dogn.

Proboscis fully developed; palpi upturned, the 2nd joint reaching

to middle of frons, moderately scaled, the 3rd moderate; maxillary palpi triangularly dilated with scales; antennæ of male laminate. Fore wing with the median nervure strongly downcurved towards end of cell, the discocellulars strongly excurved; vein 3 from before angle of cell; 5 from above angle; 6 from upper angle; 7, 8, 9 stalked from before angle; 10, 11 from cell. Hind wing with the cell short; veins 3 and 5 from near angle; 6, 7 from upper angle, 7 not anastomosing with 8.

#### Genus LORYMODES, nov.

Type, *Pyralis diagonalis*, Hmps. n.

Proboscis fully developed; palpi upturned, the 2nd joint tufted with scales produced to a point in front at extremity, the 3rd long and acuminate; maxillary palpi slightly dilated with scales, antennæ of male with fasciculate cilia, the basal joint long. Fore wing with vein 3 from close to angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked; 10, 11 from cell. Hind wing with vein 3 from close to angle of cell; 4, 5 stalked; 6, 7 from upper angle, 7 not anastomosing with 8.

#### (2) *Lorymodes stenopteralis*, sp. n.

Head, thorax, and abdomen white tinged with red-brown; antennæ fuscous except towards base. Fore wing very narrow; whitish suffused with red-brown; a slight brown antemedial mark in submedian fold; the medial part of costa with slight brown points; antemedial line slight, black defined on inner side by whitish, very oblique from costa to the postmedial line at vein 2, then inwardly oblique to inner margin, defining on inner side the postmedial line, which is rather diffused black-brown defined on outer side by whitish, very oblique and slightly curved from costa near apex to submedian fold, then still more oblique to middle of inner margin; a fine brown terminal line; cilia whitish. Hind wing silvery white. Underside of fore wing white, tinged with brown on costal half.

*Hab.* GAMBIA, 1 ♂; N. NIGERIA, Zungeru (*Macfie*), 1 ♀ type. *Exp.* 16 mm.

#### Genus DATTINIA.

	Type.
<i>Dattinia</i> , Rag. Bull. Soc. Ent. Fr. 1887, p. cxxxvii .....	<i>syrtalis</i> .
<i>Constantia</i> , Rag. Bull. Soc. Ent. Fr. 1887, p. cxxxvii ( <i>nec</i> Adams, Moll. 1860) .....	<i>leonalis</i> .
<i>Buliana</i> , Navas, Bol. Soc. Aragon, x. p. 64 (1913) .....	<i>leonalis</i> .

#### (4 e) *Dattinia eumictalis*, sp. n.

♀. Head and thorax yellowish white mixed with rufous, red-brown, and dark brown; abdomen white suffused with red-brown; antennæ white ringed with dark brown; legs white irrorated with brown. Fore wing yellowish white very thickly irrorated with rufous and red-brown and with a few dark brown scales; a whitish



subbasal spot below the cell; antemedial line strong, white, rather oblique to submedian fold and incurved at vein 1; a white spot in end of cell before the blackish-brown discoidal bar; postmedial line black-brown defined on outer side by whitish, incurved below costa, angled outwards at veins 6, 5, 4, then retracted and almost obsolete to below end of cell, then erect, sinuous and more distinctly defined on outer side by white; a terminal series of faint brown spots; cilia chequered red-brown and white. Hind wing white tinged and irrorated with red-brown; a terminal series of slight brown striæ; cilia whiter. Underside silvery white, the fore wing except on inner area and the costal area of hind wing irrorated with red-brown.

*Hab.* SUDAN, Port Sudan (*Waterfield*), 1 ♀ type. *Exp.* 32 mm.

Genus ANOBOSTRA, nov.

Type, *A. discimacula*.

Proboscis present; palpi with the 2nd joint porrect, typically projecting about the length of head, the scaling at extremity below produced to a point, the 3rd obliquely upturned, moderate; maxillary palpi dilated with scales; antennæ of male thickened and with long fasciculate cilia, the basal joint with tuft of scales. Fore wing with vein 3 from angle of cell; 4, 5 typically stalked; 6 from upper angle; 7, 8, 9 stalked; 10, 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 typically stalked; 6, 7 from upper angle, 7 not anastomosing with 8.

(1) *Anobostra discimacula*, sp. n.

Palpi with the 2nd joint projecting about the length of head; both wings with veins 4, 5 stalked.

Head and thorax purplish red; abdomen grey suffused with brown; antennæ dark brown; pectus, legs, and ventral surface of abdomen pale red irrorated with brown. Fore wing purplish red, irrorated with blackish, the medial area slightly irrorated; antemedial line blackish defined on inner side by pale red, oblique to submedian fold, where it is angled outwards; a series of small blackish spots on medial part of costa; a large black discoidal spot; postmedial line rather diffused, black defined on outer side by pale red, excurved below vein 7 and at middle and incurved at discal fold and below vein 3, a series of slight blackish streaks beyond it on the veins; a terminal series of minute black spots. Hind wing grey suffused with brown; a whitish line at middle of cilia. Underside grey suffused with brown; fore wing with the costa pale reddish with numerous brown striæ.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 2 ♂ type; PORTUGUESE E. AFRICA, Mt. Chipirone (*Neave*), 1 ♀; MASHONALAND, Umtali (*Marshall*), 1 ♀. *Exp.*, ♂ 18-20, ♀ 22-26 mm.

(3) *Anobostra albilinealis*, sp. n.

Palpi with the 2nd joint projecting about twice the length of head; both wings with veins 4, 5 from the cell.

♀. Head, thorax, and abdomen pale red-brown. Fore wing chocolate red-brown with the basal area pale red-brown except towards costa; antemedial line white, rather oblique to median nervure; a series of minute white spots on medial part of costa; postmedial line white, excurved to vein 3, then incurved; cilia greyish brown with a fine whitish line at base. Hind wing pale red-brown mixed with some whitish, the base whiter; a curved whitish postmedial line; cilia greyer brown with a fine pale line at base. Underside red-brown mixed with whitish; fore wing with series of small white spots on costa to the postmedial line, the postmedial line of both wings slightly waved.

*Hab.* ABYSSINIA, Dirre Dawa (*Drake-Brockman*), 1 ♀ type. *Exp.* 30 mm.

(4) *Anobostra punctilinealis*, sp. n.

♀. Head and thorax deep purple-red mixed with black; abdomen greyish tinged with purple-red and thickly irrorated with black; pectus, legs, and ventral surface of abdomen purplish red mixed with black, the fore tibiae and the tarsi brownish white. Fore wing deep purple-red irrorated with black; antemedial line indistinct, blackish, oblique to just below the cell, where it is angled outwards, then inwardly oblique and defined on inner side by white; the medial part of costa with series of white points; postmedial line indistinct, blackish defined on outer side by white scales and by small spots at discal and submedian folds, minutely dentate, incurved below vein 4; cilia with a fine whitish line at base. Hind wing grey tinged with purplish red and suffused and irrorated with brown, the termen and cilia redder; a faint curved dark postmedial line. Underside dull purplish red irrorated with fuscous brown; fore wing suffused with fuscous brown to the postmedial line except on costal area, a series of white points on basal half of costa; the postmedial line blackish with a slight white mark at costa; hind wing with rather diffused minutely dentate blackish postmedial line.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 3 ♀ type. *Exp.* 28 mm.

(5) *Anobostra radialis*, sp. n.

♀. Head and thorax red-brown mixed with ochreous. Fore wing greyish suffused with red-brown, especially on basal half and beyond lower angle of cell; antemedial line whitish defined by dark brown on outer side, angled outwards below costa, then obliquely curved and with some black scales before and beyond it at inner margin; some dark rufous suffusion in and below middle of cell; veins 2 to 6 streaked with whitish and defined on each side by

slight dark brown streaks to the postmedial line which is very near termen, white defined by dark brown on inner side, excurved between veins 6 and 3, then oblique and slightly sinuous; a fine brown terminal line; cilia whitish with grey medial band and line near tips. Hind wing yellowish white slightly tinged with rufous especially towards termen; an indistinct curved whitish subterminal line incurved at vein 2; cilia whitish with a slight brown line near base; the underside with the subterminal line more distinct and defined by brown on inner side.

*Hab.* BR. E. AFRICA, Taveta (*K. St. A. Rogers*), 2 ♀ type; UGANDA, Gondokoro (*Reynes-Coles*), 1 ♀. *Exp.* 30-34 mm.

(1 b) *Tyndis medio-pallens*, sp. n.

Head and tegulæ pale reddish, the thorax pale reddish mixed with dark brown; abdomen grey suffused with black-brown, the base whitish, the anal tuft rufous; antennæ and palpi irrorated with dark brown; pectus, legs, and ventral surface of abdomen whitish tinged with red-brown and irrorated with dark brown. Fore wing whitish tinged with red-brown and irrorated with dark brown, the medial area much paler except at costa, the basal costal area and a broad shade beyond the postmedial line darker; antemedial line rather diffused dark brown, slightly curved; the medial part of costa with minute greyish spots; a black striga on upper discocellular; postmedial line dark brown slightly defined on outer side by whitish towards costa, very oblique and straight; a terminal series of blackish points except towards costa and fine whitish line at base of cilia. Hind wing creamy white slightly irrorated with brown, the terminal area more thickly irrorated; traces of a brown antemedial line from cell to inner margin; a curved brown postmedial line; a brown terminal line and white line at base of cilia. Underside whitish tinged with red-brown and thickly irrorated with dark brown; both wings with small dark discoidal spot and oblique postmedial line.

*Hab.* BR. E. AFRICA, Nairobi (*Betton*), 1 ♂, Kikayu, Fort Smith (*Crawshay*), 1 ♂ type, Eb Urru (*Betton*), 1 ♂, Nakuru (*Bodeker*), 1 ♂, 1 ♀; GERM. E. AFRICA, Kilimandjaro (*Sjöstedt*), 1 ♂. *Exp.* 26 mm.

(1 c) *Tyndis pallidirufa*, sp. n.

Head and thorax whitish suffused with rufous; abdomen whitish tinged with rufous and irrorated with black, a blackish band on third segment; pectus, legs, and ventral surface of abdomen rufous irrorated with brown. Fore wing whitish suffused with rufous and irrorated with dark brown except on medial area; a rather diffused erect black almost medial line from subcostal nervure to inner margin and a similar oblique postmedial line from below costa to inner margin; a terminal series of minute black spots; cilia with blackish lines near base and tips. Hind wing

whitish suffused with reddish brown; an oblique dark postmedial shade; a dark terminal line; cilia whitish with dark lines near base and tips. Underside creamy white tinged with rufous and irrorated with brown; fore wing with dark discoidal point and suffused oblique postmedial line from below costa to inner margin; hind wing with diffused oblique black postmedial line; both wings with terminal series of minute black spots.

*Hab.* SIERRA LEONE (*Clements*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 20, ♀ 22 mm.

(6) *Tyndis pyrrhoxantha*, sp. n.

♀. Head and thorax yellow suffused with brilliant fiery red; abdomen yellowish tinged with fiery red and irrorated with fuscous; pectus, legs, and ventral surface of abdomen yellow tinged with red. Fore wing orange-yellow suffused with fiery red and irrorated with black; traces of a yellow antemedial line, oblique to submedian fold and incurved at vein 1; postmedial line rather diffused yellow, excurved at middle and incurved at submedian fold. Hind wing yellow, the inner and terminal areas faintly tinged with red and the latter irrorated with blackish. Underside orange-yellow; fore wing with minute dark discoidal point, the terminal area tinged with red and irrorated with black; hind wing with the apex tinged with red and irrorated with black.

*Hab.* GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 22 mm.

V.—*The Homoptera of Indo-China.*

By W. L. DISTANT.

Fam. Cicadidæ.

For some time Mon. R. Vitalis de Salvaza has sent me collections of Homoptera from this very interesting region, and I believe he intends at some future date to publish an illustrated work on the insect fauna of Indo-China. The Homoptera already received are from the frontier of Laos, East Annam, and from Lao Kay and Chapa in Tonkin. In this contribution I give a rough list of the species already received, which number fifty-five, belonging to the family Cicadidæ alone. Examples of all these, including types and uniques, are placed in the collection of the British Museum, which, as regards this family, is now by far the largest and most complete in the world.

I also add the descriptions of six new species.

*List of Species already received.*

*Platypleura badia*, Dist.  
 — *nigrosignata*, Dist.  
*Tosena melanoptera*, White.  
*Rihana bimaculata*, Oliv.  
*Cryptotympana mandarina*, Dist.  
 — *holsti*, Dist.  
*Inthaxara rex*, Dist.  
*Salvazana mirabilis*, Dist.  
*Leptopsaltria phra*, Dist.  
*Dundubia mannifera*, Linn.,  
 var. *terpsichore*, Walk.  
*Cosmopsaltria fratercula*, Dist.  
 — *copaga*, Dist.  
 — *andersoni*, Dist.  
 — *tonkiniana*, Jac.  
*Haphsa nana*, Dist.  
*Platytonia nagarasingna*, Dist.  
 — *operculata*, Dist.  
 — *radha*, Dist.  
*Meimuna microdon*, Walk.  
 — *subviridissima*, Dist.  
 — *rara*, Dist.  
*Pomponia intermedia*, Dist.  
 — *fusca*, Oliv.  
 — *lactea*, Dist.  
*Aola scitula*, Dist.  
 — *bindusara*, Dist.  
*Terpnosia crowfooti*, Dist.

*Terpnosia posidonias*, Jac.  
 — *madhava*, Dist.  
 — *chapana*, Dist.  
 — *ransonneti*, Dist.  
 — *rustica*, Dist.  
 — *mesonotalis*, Dist.  
 — *clio*, Walk.  
 — *mawi*, Dist.  
*Culeagninus salcazanus*, Dist.  
*Gaeana vitalisi*, Dist.  
 — *maculata*, Dru.  
 — *annamensis*, Dist.  
 — *sultana*, Dist.  
 — *pavici*, Noualh.  
*Balinta pulchella*, Dist.  
 — *delinenda*, Dist.  
*Talainga binghami*, Dist.  
 — *distanti*, Jac.  
*Mogannia cyanea*, Walk.  
 — *hebes*, Walk.  
 — *cesar*, Jac.  
 — *conica*, Germ.  
 — *indigotea*, Dist.  
*Huechys sanguinea*, De Geer.  
 — *tonkinensis*, Dist.  
*Scieroptera splendidula*, Fabr.  
*Lemuriana apicalis*, Germ.

*Terpnosia rustica*, sp. n.

Head, pro- and mesonotum pale olivaceous green; head with two spots at apex of front and a lateral spot near base of antennæ, two curved central lines on vertex, and a spot above margins of eyes and two small spots between central fasciæ and eyes black; pronotum with two central longitudinal fasciæ which are angulated anteriorly and posteriorly, the furrow behind eyes, and the lateral margins black; mesonotum with central obconical lines which are centrally, posteriorly prolonged, a sublateral line on each side, and a spot near each anterior angle of the basal cruciform elevation black; abdomen above and beneath ochraceous, with the basal margin and apical area black, the basal segments above are also centrally spotted with black; legs and opercula pale olivaceous-green, the latter with black lateral margins, the tarsi ochraceous and apically black; tegmina and wings subhyaline, the first with the veins blackish, the transverse veins at the bases of first, second, and third apical areas with pale brown suffusions and some obscure spots of the same colour on the longi-

tudinal veins to apical areas, costal and post-costal membranes ochraceous; wing-venation blackish; opercula in female short and transverse, subconically oblique, not extending beyond base of abdomen; face conically produced and somewhat strongly laterally striate; base of head at region of ocelli sulcate; pronotum centrally longitudinally sulcate; tympanal coverings both narrower and shorter than tympanal cavities.

Long., excl. tegm., ♂, 15 mm.; exp. tegm. 49 mm.

*Hab.* Tonkin, Chapa (*R. Vitalis de Salvaza*).

This species may be placed near *T. ransonneti*, Dist.

*Terpnosia chapana*, sp. n.

♂. Head, pronotum, mesonotum, face, sternum, legs, and opercula olivaceous green; abdomen above and beneath pale testaceous, the abdominal margins a little darker, and the apical abdominal area black; lineate markings to anterior margin of front, a transverse spot near insertion of antennæ, and a suffusion at the region of the ocelli black; pronotum with two central longitudinal linear fasciæ, narrowed and united at base, the furrows, two spots on each lateral area, and the extreme basal margin black; mesonotum with the margins of two anterior obconical spots, followed on each side of anterior margin by a small angulate spot and again by a submarginal longitudinal fascia, a central longitudinal spot reaching middle of cruciform elevation and a spot before each anterior angle of same, black; tegmina and wings subhyaline, the venation black or blackish, tegmina with the costal membrane and post-costal area ochraceous, the transverse veins at the bases of the second, third, and fifth apical areas, and the apices of the longitudinal veins to the apical areas spotted with fuscous; tympanal coverings well developed, but shorter and narrower than tympanal cavities; face centrally sulcate and strongly transversely striate, vertex between the ocelli sulcate; opercula subtruncately oblique, scarcely passing the base of abdomen; greatest width of tegmina about one-third of length.

Long., excl. tegm., ♂, 18 mm.; exp. tegm. 55 mm.

*Hab.* Tonkin, Chapa (*R. Vitalis de Salvaza*).

The nearest allied species is *T. posidonias*, Jac.

*Terpnosia mesonotalis*, sp. n.

♂. Head, pronotum, abdomen above and beneath, sternum and legs ochraceous, the upper surface of the

abdomen moderately rufescent; mesonotum uniformly pale ochraceous; pronotum with the sublateral furrow marked with black; the mesonotal cruciform elevation dark testaceous; opercula pale ochraceous; tegmina and wings subhyaline, the veins fuscous; tegmina with the costal membrane and post-costal area dull ochraceous with dark linear markings, extreme basal angle of upper ulnar area dark fuscous; vertex of head sulcate between the ocelli; sublateral furrows to pronotum very profound; face with very strong transverse ridges; tympanal coverings small, very much shorter and a little narrower than tympanal cavities; opercula short and broad, not quite reaching base of abdomen.

Long., excl. tegm., ♂, 17 mm.; exp. tegm. 45 mm.

*Hab.* Tonkin; Chapa (*R. Vitalis de Salvaza*).

To be placed near *T. madhava*, Dist.

*Calcagninus salvazanus*, sp. n.

♂. Body and legs ochraceous, mesonotum a little paler, sometimes blackish markings at base of abdomen beneath; tegmina and wings subhyaline, the venation fuscous brown, tegmina with the whole of the costal and subcostal areas ochraceous; tympanal coverings imperfect; abdomen tuberculate beneath on second and third abdominal segments; head about as long as half the width between eyes; wings with six apical areas; mesonotum sometimes with indications of two dark lateral longitudinal fasciæ; opercula wide apart, transverse, not passing basal abdominal segment, apical margins roundly truncate; face with the lateral striations distinct, but not profound; vertex of head narrowly longitudinally sulcate between the ocelli.

Long., excl. tegm., ♂, 15 mm.; exp. tegm. 45 mm.

*Hab.* Tonkin; Chapa (*R. Vitalis de Salvaza*).

*Mogannia indigotea*, sp. n.

Body and legs very dark indigo-blue; tegmina and wings hyaline, the venation dark ochraceous; tegmina with about basal half flavescent, outwardly margined with a transverse fuscous fascia and an oblique macular fascia directed inwardly and the basal cell of the same colour, costal membrane dark ochraceous; base of wings narrowly dark ochraceous. Front of head longly hirsute and longly depressed, between the ocelli longitudinally sulcate; pronotum with the furrows profound; rostrum reaching the intermediate coxæ.

Long., excl. tegm., 14–17 mm.; exp. tegm. 34–40 mm.

*Hab.* Tonkin; Chapa (*R. Vitalis de Salvaza*). N. China (*Brit. Mus.*). Philippine Is.; Malinao, Tayabas (*C. T. Baker*).

A somewhat variable species, allied to *M. effecta*, Dist. In some specimens the basal cell of tegmina is ochraceous, in others the inner and outer dark fasciæ of the basal area are fused.

*Huechys tonkinensis*, sp. n.

Head, pronotum, and mesonotum black; vertex of head with almost anterior half, the ocelli and an angulated spot behind them, pronotum with a central, broad, longitudinal fascia which is strongly, medially, angularly compressed, mesonotum with the lateral margins and a medial, longitudinal, anteriorly strongly attenuated fascia sanguineous; face black, apically sanguineous; sternum, opercula in male, body beneath and above sanguineous; legs black; tegmina dark brownish, the venation darker; wings subhyaline, the venation dark brownish; head with the face strongly, centrally, longitudinally sulcate for about two-thirds its length, the transverse lateral striations very coarse; head (including eyes) about as wide as base of mesonotum; head about as long as pronotum; mesonotum (including cruciform elevation) longer than pronotum; tegmina with eight apical areas; opercula in male not passing base of abdomen, well separated, but inwardly obliquely directed; their apices roundly truncate.

Long., excl. tegm., ♂, 18 mm.; exp. tegm. 40 mm.

*Hab.* Tonkin; Chapa (*R. Vitalis de Salvaza*).

Allied to *H. chryselectra*, Dist., from Borneo.

VI. — *Notes on Fossorial Hymenoptera*. — XXV. *On new Sphecoidea in the British Museum*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Subfamily *PHILANTHINÆ*.

*Cerceris armigera*, sp. n.

♀. Nigra; clypeo, mandibulis basi, scapo, fronte sub antennis, segmento dorsali secundo macula basali utrinque, segmentisque quarto quintoque fascia apicali emarginata flavis; vertice macula utrinque pone oculos, pronoto macula utrinque, tegulis, femoribus



anticis, femoribus intermediis apice, tibiis tarsisque anticis intermediisque brunneo-ferrugineis; segmentis dorsalibus secundo, quarto, quintoque omnino, tertioque apice ferrugineis; alis hyalinis, venis nigris; clypeo brevissimo, subporrecto, apice latissime emarginato, angulis apicalibus dente valido armato; mesopleuris haud dentatis; segmento mediano area basali subopaca, delicatissime punctata, segmento ventrali secundo area basali elevata nulla.

Long. 8 mm.

♀. Coarsely and closely punctured; head very broad, the eyes distinctly divergent towards the clypeus; cheeks nearly as broad as the eyes. Antennæ inserted rather low down, nearly three times as far from the anterior ocellus as from the base of the clypeus, second joint of the flagellum a little longer than the third. First abdominal segment distinctly broader than long; pygidial area coarsely but rather sparsely punctured, elongate-ovate, rather broadly truncate at the apex. Abdominal segments very strongly constricted, the ventral surface almost smooth. First recurrent nervure received a little before the middle of the second cubital cell, second close to the base of the third cubital cell.

*Hab.* S. Queensland, Darra near Brisbane (*Hacker*); December.

The shape of the clypeus is remarkable and quite different from any other Australian species.

*Cerceris unispinosa*, sp. n.

♀. Nigra; mandibulis basi, clypeo, fronte usque ad antennarum basin, scapo, genis late, vertice macula obliqua utrinque, pronoto fascia utrinque, tegulis, scutello macula transversa utrinque, postscutello, segmento dorsali secundo macula transversa basali, tertio fascia apicali antice late emarginata, quarto fascia angusta apicali, quinto fere omnino, segmentis ventralibus tertio quintoque lateribus, femoribus anticis intermediisque subtus, tibiis tarsisque anticis intermediisque flavis; segmento dorsali secundo dimidio basali, segmentis ventralibus secundo fere toto, tertio in medio, femoribus anticis intermediisque supra, pedibusque posticis ferrugineis; alis hyalinis, apice et cellula radiali infumatis, venis nigris; clypeo plano, apice subemarginato, margine apicali in medio dente nigro parvo armato; mesopleuris haud tuberculatis; segmento mediano area basali subopaca, impunctata; segmento ventrali secundo area basali elevata nulla.

Long. 9 mm.

♀. Strongly and closely punctured; head very broad, eyes distinctly divergent towards the clypeus, antennæ inserted about twice as far from the anterior ocellus as from

the base of the clypeus; cheeks very broad, much broader than the eyes; first abdominal segment a little longer than the greatest breadth; pygidial area rugulose, elongate-ovate, rather narrowly truncate at the apex; second ventral segment almost smooth, the other ventral segments sparsely and shallowly punctured.

*Hab.* S. Queensland, Darra near Brisbane (*Hacker*); December.

Not very near to any other Australian species.

#### Subfamily NYSSONINÆ.

*Nysson (Acanthostethus) brisbanensis*, Turn.

*Nysson (Acanthostethus) brisbanensis*, Turn. Ann. & Mag. Nat. Hist. (8) xv. p. 81 (1915). ♀.

♂. The male has the ventral segments bare, without a fringe of hairs; ventral segments 3-6 with a small but distinct spine on each side at the apical angles; seventh dorsal segment widely and rather shallowly emarginate at the apex, the angles produced into short blunt spines.

*Hab.* Brisbane (*Hacker*); February.

Differs from *nudiventris*, Turn., to which species the female is most nearly allied, in the shape of the seventh dorsal segment, which only has two spines (one at each apical angle), also in the presence of a short spine at the apical angles of the sixth ventral segment. The only specimen sent is very small, measuring only 4 mm. in length.

#### Subfamily CRABRONINÆ.

*Encopognathus brownei*, sp. n.

♀. Nigra, ubique dense rugose punctata; scapo, callis humeralibus, postscutello, femoribus apice extremo, tibiis tarsisque pallide flavis; tibiis intermediis posticisque infra fuscis; alis hyalinis, iridescentibus, venis fuscis, stigmate testaceo.

Long. 5 mm.

♀. Mandibles excised on the outer margin, acute at the apex. Clypeus subcarinate longitudinally, produced into two porrect teeth at the apex, with a smaller tooth on each side near the apical angles. Eyes not hairy, the facets in front larger than elsewhere, separated from each other at the base of the clypeus by a distance equal to about half the length of the scape; frontal groove smooth and shining. Posterior ocelli a little nearer to the eyes than to each other, the ocellar region and the vertex coarsely punctured-rugose,

an oblique groove from the eyes to the posterior ocelli; the hind margin of the head slightly raised, subcarinate. Pronotum transverse, the anterior margin raised and sharply pointed at the angles; thorax very coarsely punctured, the mesopleuræ coarsely rugose. Median segment short; with a distinct enclosed basal area, which is very finely rugulose, with five strong longitudinal carinæ; the posterior slope rather indistinctly transversely striated; the sides of the segment very finely and closely punctured. Abdomen smooth and shining beneath, the three basal dorsal segments coarsely punctured, the three apical segments closely and finely punctured. Recurrent nervure received before the middle of the cubital cell; transverse cubital nervure received just beyond the middle of the radial cell.

*Hab.* British East Africa, Tana River, 3000 ft., near Mt. Kenia (*G. Orde Browne*); November.

This is distinct both in colouring and in structural details from *E. braueri*, Kohl., also in the sculpture of the abdomen.

*Rhopalum tuberculicorne*, sp. n.

♂. Niger; scapo, tuberculis humeralibus, pedibus anticis, pedibus intermediis tarsis infuscatis, coxisque posticis apice flavis; flagello fusco subtus ferrugineo; segmentis dorsalibus 5-7, ventralibus 2-7, tibiis posticis tegulisque pallide ferrugineis; alis hyalinis, iridescentibus, venis nigris, cellula radiali infuscata. Long. 4 mm.

♂. Clypeus without a carina, clothed with silver pubescence, the apical margin almost transverse. Mandibles blunt at the apex, not bidentate. Second joint of the flagellum longer than the third, emarginate at the base beneath and produced into a stout tubercle at the apex beneath. Head smooth and shining; the eyes separated at the base of the clypeus by a distance slightly exceeding the length of the scape, strongly divergent towards the vertex; posterior ocelli as far from the eyes as from each other, and also as far from the hind margin of the head as from each other, a short longitudinal sulcus between them. Pronotum short, a minute spine at the anterior angles. Thorax shining, microscopically punctured; median segment smooth and shining. First abdominal segment scarcely longer than the second, moderately swollen at the apex, second segment broadened from the base, third segment broader than long. Hind tibiæ broad, with a few small spines on the outer margin. Recurrent nervure received just before two-thirds from the base of the cubital cell; radial cell broadly truncate at the apex,

the costal margin shorter than the stigma, the transverse cubital nervure received a little beyond one-quarter from the base of the cell.

*Hab.* S. Queensland, Caloundra (*Hacker*) ; January.

Nearly related to *R. tenuiventris*, Turn., but the abdomen is more slender in that species, the third segment being much longer than broad ; in *tenuiventris* ♂ the scape has a small spine at the apex, the second joint of the flagellum is rather more strongly emarginate beneath, and the third joint is also strongly emarginate beneath and subtuberculate at the apex. The epicnemial area is defined in both species. In most Australian species of *Rhopalum* the male antennæ are not strongly differentiated, but in *R. alicia*, Turn., and *R. leptospermi*, Turn., the third joint of the flagellum is strongly emarginate beneath and subtuberculate at the apex.

• *Rhopalum testaceum*, sp. n.

♀. Testacea ; capite mesonotoque nigris ; mandibulis, apice excepto, clypeoque flavis ; antennis testaceis ; alis hyalinis, iridescentibus, venis fuscis.

Long. 4 mm.

♀. Mandibles acute at the apex, not bidentate ; clypeus broadly rounded at the apex, with four minute teeth on the apical margin, without a carina. Head smooth and shining ; the eyes separated at the base of the clypeus by a distance equal to rather more than two-thirds of the length of the scape ; posterior ocelli as far from the eyes as from each other and about the same distance from the hind margin of the head ; a curved groove from the inner margin of the eye, extending towards, but not reaching, the posterior ocelli. Pronotum depressed below the mesonotum, almost vertical. Thorax closely and minutely punctured, a transverse groove at the base of the scutellum. Median segment smooth and shining, with a distinct median sulcus. First abdominal segment a little shorter than the second, moderately swollen at the apex, not very slender ; second segment longer than the apical breadth ; third segment much broader than long. Hind tibiæ very feebly serrate near the apex. Recurrent nervure received a little before two-thirds from the base of the cubital cell ; radial cell oblique at the apex, the costal margin as long as the stigma, the transverse cubital nervure received just beyond one-quarter from the base of the cell.

*Hab.* N. Queensland, Kuranda (*F. P. Dodd*).

Easily distinguished by the remarkable colouring. The first abdominal segment is shorter than in other Australian

species except *frenchi* and *macrocephalus*, and the hind tibiæ are much less swollen than is usual in the genus.

Subfamily *TRYPOXYLONINÆ*.

*Pison deperditum*, sp. n.

♀. Nigra; mandibulis, palpis, antennis, abdomine pedibusque rufo-ferrugineis; tegulis testaceis; alis hyalinis, venis fuscis; segmento mediano crasse rugoso, sulco mediali lato, transverse striato.

Long. 7 mm.

♀. Clypeus broadly rounded at the apex, clothed with whitish pubescence, which extends on to the front. Second joint of the flagellum about equal to the third, nearly twice as long as the first. Eyes separated at the base of the clypeus by a distance equal to nearly twice the length of the scape, and by about the same distance on the vertex; posterior ocelli a little further from each other than from the eyes, separated from each other by a distance equal to the diameter of one of them, with a shallowly impressed transverse line behind them. Front with a low carina from the base of the antennæ reaching halfway to the anterior ocellus. Pronotum transverse, with a narrow depression along the hind margin; thorax smooth, opaque. Median segment very coarsely rugose-reticulate, with short oblique striæ at the base, and a very wide transversely striated longitudinal sulcus, the posterior slope irregularly transversely striated. Abdomen microscopically punctured, the segments broadly but very shallowly depressed on the apical margin. First recurrent nervure received just before the apex of the first cubital cell, second received close to the middle of the second cubital cell; third cubital cell on the radius very short, shorter than the petiole of the second cubital cell.

*Hab.* Port Darwin, Northern Territory (*G. F. Hill*).

This is very closely allied to *P. ruficornis*, Sm., from which, however, it is easily distinguished by the very different and much coarser sculpture of the median segment. The neururation in both species is that of the section *Pisonitus*, Shuck.

*Pison multistrigatum*, sp. n.

♀. Nigra; palpis testaceis; calcaribus unguiculisque ferrugineis; alis hyalinis, apice leviter infumatis, venis fuscis; segmento mediano fortiter longitudinaliter striato.

Long. 9 mm.

♀. Clypeus broadly truncate at the apex, clothed with silver pubescence. Head opaque, finely punctured; eyes separated at the base of the clypeus by a distance about equal to three times the length of the scape, but by only about half that distance on the vertex; second joint of the flagellum distinctly longer than the third and about twice as long as the first; posterior ocelli about twice as far from each other as from the eyes. Thorax subopaque, finely and closely punctured; the pronotum transverse, a little depressed on the posterior margin. Median segment very coarsely longitudinally striated; the sides of the segment finely horizontally striated, with fine punctures between the striæ; posterior slope transversely striated, with a deep median sulcus. Abdomen shining, very finely punctured, the segments rather feebly depressed at the apex; second ventral segment more sparsely punctured in the middle than on the sides; the apical angles of the dorsal segments with a little white pubescence. First recurrent nervure received close to the apex of the first cubital cell, second at the apex of the second cubital cell, almost interstitial with the second transverse cubital nervure. Third cubital cell shorter on the radius than the petiole of the second cubital cell.

*Hab.* Nyasaland, Mlanje (*S. A. Neave*); February.

Differs from all other species known to me by the very strong longitudinal striation of the median segment.

*Pison strigulosum*, sp. n.

♀. Nigra; fronte argenteo-pubescente; mandibulis, femoribus apice, tibiis tarsisque ferrugineis; tegulis testaceis; alis hyalinis, iridescentibus, venis nigris, segmento mediano basi oblique, apice transverse striato.

Long. 8 mm.

♀. Clypeus without a carina, broad, the apical margin slightly oblique on the sides and forming a distinct angle in the middle. Head opaque, a distinct frontal sulcus reaching the anterior ocellus. Front broad, the eyes at the base of the clypeus more than half as far again from each other as on the vertex. Posterior ocelli nearer to the eyes than to each other; second joint of the flagellum distinctly longer than the third. Thorax minutely and closely punctured, the pronotum and mesopleuræ clothed with short silver pubescence. Median segment obliquely striated at the base, the striæ becoming rather finer and more transverse towards the apex, the apical slope coarsely transversely striated; at the base of the segment is a very small triangular space enclosed

by sulci; from the apex of the triangle a longitudinal transversely striated groove runs to the apex of the segment, and is continued after a narrow interruption on the apical slope. Abdomen finely punctured, somewhat pubescent, the three basal segments shallowly depressed on the apical margin; second ventral segment microscopically punctured, more finely than the third; second to fourth ventral and third to fifth dorsal segments very narrowly pale testaceous at the apex. Third cubital cell as long on the radius as the petiole of the second cubital cell; recurrent nervures received just before the first and second transverse cubital nervures.

*Hab.* Gold Coast, Tamale (*Dr. C. E. S. Watson*).

This belongs to the group of *P. vanthopus*, Brullé, but may be distinguished by the less oblique striation of the median segment, the colour of the pubescence on the front, and the shape of the clypeus.

*Pison carinatum*, sp. n.

♀. Nigra; mandibulis in medio fusco-ferrugineis; calcaribus pallide testaceis; alis hyalinis, margine apicali leviter infuscatis; fronte argenteo-sericeo, abdomine segmentis dorsalibus 1-3 margine apicali albido pubescentibus.

♂. Feminae similis; tarsis rufescentibus; segmentis abdominalibus 4-7 rufis; segmento dorsali septimo lato, deflexo, apice subtruncato.

Long., ♀ 7, ♂ 6 mm.

♀. Clypeus with a low longitudinal carina on the basal half, broadly subtruncate at the apex. Head opaque, with a delicate longitudinal sulcus on the front reaching to the anterior ocellus. Eyes more than half as far again from each other at the base of the clypeus as on the vertex; posterior ocelli a little nearer to each other than to the anterior ocellus, further from each other than from the eyes; second joint of the flagellum a little shorter than the third. Thorax closely and minutely punctured, more strongly on the mesopleuræ than on the mesonotum; median segment finely obliquely striated, depressed longitudinally in the middle, with a distinct longitudinal carina, the apical slope transversely striated, the sides of the segment finely and closely punctured. Abdomen on both surfaces closely and microscopically punctured; sixth dorsal segment broadly triangular, convex, subcarinate longitudinally in the middle. The position of the recurrent nervures and also the length of the third cubital cell on the radius show much variation in this species.

The male has the clypeus more produced in the middle

than in the female, but has the carina at the base; the eyes are a little further apart on the vertex, the second joint of the flagellum is fully as long as the third. The broad form of the seventh dorsal segment is remarkable.

*Hab.* Ashanti, Obuasi (*W. M. Graham*), April, February; Uganda, Entebbe (*C. G. Gowdey*) (type), September and March; Egypt, Meadi (Egyptian Department of Agriculture), July; Sierra Leone (*Morgan*).

I had identified this species as *xanthopus*, Brullé, in my recent paper on *Pison* (Proc. Zool. Soc. 1916), but since then have found other specimens answering much better to Brullé's description. The present species may possibly be *obscurus*, Shuck., but the type of that species is lost and the description gives the pubescence of the front as golden, as in *xanthopus*.

*Pison xanthopus*, Brullé.

*Nephridia xanthopus*, Brullé, Ann. Soc. Ent. France, ii. p. 408 (1833).  
♀.

Four females in the National Collection answer well to the description. They differ from *carinatum* and *strigulosum* in the bright golden pubescence of the front and in the red colour of the two or three apical abdominal segments. There is no basal carina on the clypeus as in *carinatus*, which it resembles in the sculpture of the median segment, and differs in the latter point from *strigulosum*. The clypeus is more distinctly truncate at the apex than in either of the other species. *P. clypeatus*, Cam., seems to belong to the same group. I do not think that Shuckard's description of *obscurus* can be meant for the present species.

*Hab.* N. Nigeria, Kateri (*J. J. Simpson*), December; Gold Coast, Aburi (*L. Armstrong*), April.

*Pison flavolimbatus*, sp. n.

♀. Nigra; segmentis dorsalibus tribus basalibus fascia apicali flavidula; scapo tegulisque brunneo-testaceis; fronte, pronoto segmentoque mediano lateribus pallide aureo-pubescentibus; alis subhyalinis, costa late infuscata, venis nigris.  
Long. 10 mm.

♀. Clypeus convex, broadly truncate at the apex, without a carina; head opaque, a distinct frontal sulcus reaching to the anterior ocellus; eyes a little further apart at the base of the clypeus than on the vertex, posterior ocelli as near to each other as to the eyes; an undulating, low, transverse ridge separating the anterior from the posterior ocellar



region. Second joint of the flagellum slightly longer than the third. Thorax opaque, minutely and very closely punctured; median segment similarly punctured, with a median longitudinal sulcus, shallow and narrow on the dorsal surface, deep and broader on the posterior slope, the extreme apex with a few transverse striæ. Abdomen closely and minutely punctured, rather more strongly on the ventral than on the dorsal segments; sixth dorsal segment triangular, convex. Both recurrent nervures received by the second cubital cell, the first near one-quarter from the base, the second very near the apex; radial margin of the third cubital cell variable in length, but longer than the petiole of the second cubital cell.

*Hab.* British Guiana, Issororo (*C. B. Williams*); July. Three females.

The development of the yellow abdominal fasciæ, which are chitinous, varies considerably, being rather obscured in one specimen. This is quite distinct from *P. paraense*, Spin., which also has yellowish abdominal fasciæ, but is much smaller and is without the broad fuscous costal margin of the fore wing, and differs in other details of colour, also in the position of the first recurrent nervure.

VII.—On the External Characters of the Felidæ. By  
R. I. Pocock, F.R.S., Superintendent of the Zoological  
Society's Gardens.

THE facts recorded in this paper are based upon an examination, extending over many years, of specimens that have died in the Zoological Society's Gardens. Although unavoidably incomplete, the observations probably, I think, cover the range of variation in the characters discussed within the limits of the family.

*The Ears.*

The ears of the Felidæ are very constant in their general features, so far as my observations have carried me, and do not differ essentially from those of the typical Viverridæ. The *bursa* is always present and large. Its posterior flap rises behind the rim of the pinna above, and the anterior flap is always deeply notched. These features are observable even in newly-born kittens. The main cartilages also differ but little from species to species; but neither in the structure of the bursa nor of the cartilages have I been able to establish

any features of systematic value. A more detailed comparison than I have made may, however, show that such differences

Fig. 1.



A. Left ear of *Felis ruffus esquinapæ*, nat. size.

B. " " *jaguarondi*, " "

C. " " *salinarum*, " "

exist. For instance, in *F. eyra* the excrescence on the antero-internal ridge overlapping the anterior end of the supratragus (*plica principalis*) is rather unusually well developed.

Usually the ears are rounded at the summit, but in the species of the genus *Felis* (s. s.), e. g. *F. sylvestris*, *ocreata*, *chaus*, and their allies, and also in the lynxes, *F. lynx*, *ruffus*, *caracal*, they are more angular and pointed. In all the lynxes, moreover, the tip is provided with a pencil of hairs, which are especially well developed in *F. caracal* and smallest in *F. ruffus*. In the latter they are sometimes temporarily absent during the moult; but they are never absent in *F. caracal*. That these ear-tufts cannot be regarded as a generic feature is shown by the frequent presence of similar but smaller tufts in *F. ocreata*, *F. chaus*, and *F. ornata*.

Of all the species known to me, *F. jaguarondi*\* and *F. manul* have relatively the smallest and least conspicuous ears. In the former their smallness, coupled with the general shape of the narrow head, imparts a decidedly musteline physiognomy to the species. In *F. manul* the width of the head and the height of the forehead make the ears appear to be set very low behind the cheek, and they certainly are never raised above the summit of the head when pricked†. *F. serval* presents the greatest possible contrast to *F. manul* in this particular, the ears being large and capable of being closely juxtaposed on the top of the head when pricked. In no other species is this power developed to the same extent.

The ear of *Acinonyx* conforms in shape and structure to that of other round-eared members of the family Felidæ (Ann. & Mag. Nat. Hist. (8) xviii, pp. 422-423, fig. 2 A, 1916).

### The Rhinarium.

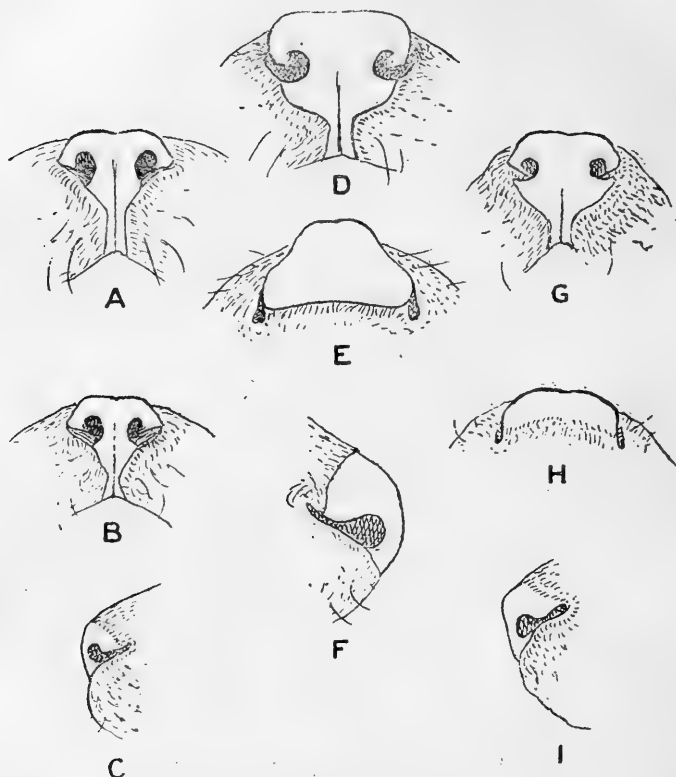
The muzzle of the Felidæ differs from that of the Viverridæ, Cryptoproctidæ, Mungotidæ, and their allies in being bluntly truncated, the nose, that is to say, projects to a comparatively slight extent beyond the lower jaw. This feature, coupled with the shortness of the jaws, gives a very characteristic appearance to the face of the Felidæ as compared with that of other Æluroids in which the muzzle noticeably recedes from the anterior edge of the prominent rhinarium to the sloping chin. There is, however, a certain amount of variation in the Felidæ with respect to this character. In all species, it may be added, the upper lip is cleft by a laterally distensible and mesially grooved strip of naked skin, confluent above with

\* If *F. braccata*, Cope, as stated, has pointed ears, it is probably not related to *F. jaguarondi* as claimed by its describer.

† So far as my memory serves, the ears in *F. manul* are rounded and not angular, as one would expect from the affinity of this species to typical *Felis* and to the lynxes.

the rhinarium and extending inferiorly to the edge of the lip; and the median groove impressing this strip passes up the anterior surface of the rhinarium approximately or actually as high as the upper rim of the nostrils. The infranarial

Fig. 2.

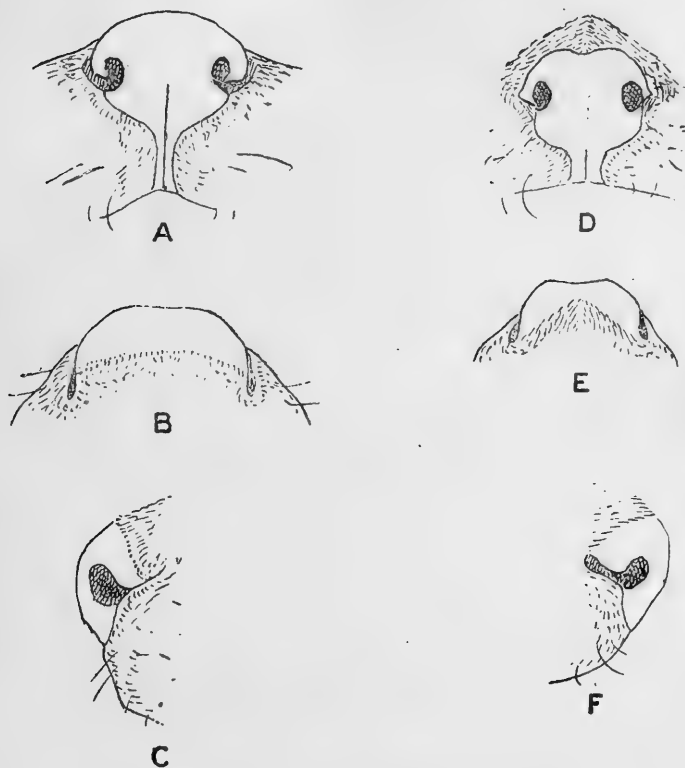


- |    |  |                                      |
|----|--|--------------------------------------|
| A. | Rhinarium of <i>Felis sylvestris</i> , | from the front.                      |
| B. | " "                                    | " <i>ocrea</i> , " "                 |
| C. | " "                                    | " " from the side.                   |
| D. | " "                                    | " <i>serval</i> , from the front.    |
| E. | " "                                    | " " from above.                      |
| F. | " "                                    | " " from the side.                   |
| G. | " "                                    | " <i>salinarum</i> , from the front. |
| H. | " "                                    | " " from above.                      |
| I. | " "                                    | " " from the side.                   |

portion of the rhinarium, so pronounced in *Mungotidæ* and most of the "lower" *Æluroidea*, is either suppressed or developed to only a small extent.

In the genus *Felis* (s. s.), as exemplified by *F. sylvestris* and *F. ocreata*, the rhinarium is comparatively small, exhibiting from the dorsal view a very narrow naked area beyond the hair of the summit of the muzzle. Viewed from the front,

Fig. 3.



- |    |                                      |                                     |
|----|--------------------------------------|-------------------------------------|
| A. | Rhinarium of <i>Felis pardalis</i> , | from the front.                     |
| B. | " "                                  | from above.                         |
| C. | " "                                  | from the side.                      |
| D. | " "                                  | <i>jaguarondi</i> , from the front. |
| E. | " "                                  | from above.                         |
| F. | " "                                  | from the side.                      |

its upper edge is horizontal with a slight median depression and rounded angles. The median portion below the level of the nostrils, which are moderately far apart, is acutely angled inferiorly, and there is no definite strip extending laterally beneath the nostrils. The rhinarium of an example of

*F. ocreata* from Somaliland differs from that of an example of *F. sylvestris* from Scotland in having the area between the nostrils and the angular portion immediately below it rather narrower (fig. 2, A, B, C).

The lynxes (*F. caracal*, *F. ruffus esquinapæ*, and *F. lynx isabellinus*) have the rhinarium relatively larger and more prominent than *F. sylvestris* and *F. ocreata*, the naked portion seen from above being less overgrown by the hair of the muzzle. Otherwise there is no great difference between them. In an example of *F. lynx isabellinus* the upper margin seen from the front is more convex than in *F. caracal* and in *F. ruffus esquinapæ*, and the nostrils are somewhat larger, possibly in adaptation to a life at high altitudes, where the atmosphere is more rarified (fig. 4, C).

In the smaller tropical and subtropical Felidæ of America the rhinarium is large as compared with that of *F. ocreata* and *sylvestris*, as may be seen by comparing the drawings of this organ in a specimen of *F. ocreata* from Somaliland and of *F. salinarum* from Cordova in the Argentine, the cats themselves being approximately equal in size. In the case of *F. salinarum*\* the rhinarium exhibits a naked area of considerable size when seen from above, the nostrils are wider apart than in *F. ocreata*, and the infranarial portion is wider transversely and much less acutely angled inferiorly (fig. 2, B, C, & G, H, I).

In *F. wiedii* the rhinarium is very similar to that of *F. salinarum*.

In an example of *F. pardalis* (fig. 3, A, B, C) from Mañaos the rhinarium is rather more prominent than in examples of *F. wiedii* examined, and has the internarial septum wider, the edge more convex in profile view, and the upper edge also more convex when viewed from the front. Nevertheless, the general similarity between them is unmistakable.

In an adult *F. jaguarondi* (fig. 3, D, E, F) from Cordova, in the Argentine, the muzzle projects, and the hairs on its summit form a high crest, which anteriorly encroaches in the middle line on the rhinarium, forming an angular projection over the middle of its upper side. In profile view the margin is convex. From the front view the upper edge is mesially notched by the hairy crest, the internarial septum is broad, and the portion below the nostrils deep. But in a young specimen of the typically-coloured form of this species

\* This form, described by Mr. Thomas (Ann. & Mag. Nat. Hist. (7) xii. p. 239, 1903), is closely related to the better-known *F. geoffroyi*. Possibly it should be regarded merely as a subspecies.

these characteristics of the rhinarium observed in the adult *cyra*-coloured specimen from Cordova are less marked\*.

I have only examined the rhinarium in two of the tropical Asiatic species, namely *F. viverrina* and *F. nebulosa*. In the former the rhinarium is tolerably similar to that of *F. pardalis*, but is relatively smaller and less prominent. In *F. nebulosa*, on the other hand, it differs but little from the rhinarium of *Panthera* † described below.

In the matter of prominence and the great size of the the naked area, when viewed from above, the rhinarium of *F. serval* (fig. 2, D, E, F) surpasses that of all other species of Felidæ. From the dorsal aspect it is broadly cordate. In profile view its margin is rather strongly convex and projects well beyond the lips. From the front its superior edge is transverse, with rounded angles; the portion above the nostrils is high, and the area below them wide, comparatively deep, and not acutely angled inferiorly. The rhinarium, indeed, is an exaggeration of the type seen in *F. pardalis*. The differences between it and the rhinarium of *F. ocreata* and *sylvestris* are particularly worthy of note.

In an example of *F. concolor*, three months old, the rhinarium seen from above exhibits a tolerably extensive naked tract, although not so large as that of *F. pardalis*. Nor is the rhinarium so convex and prominent in profile view as in that species. Moreover, from the front aspect the area above the nostrils is deeper, that below them is narrower, and the nostrils themselves are closer together.

The rhinarium, it may be noted, is not like that of *Panthera*, but in its general features approaches the rhinarium of the smaller members of the Felidæ.

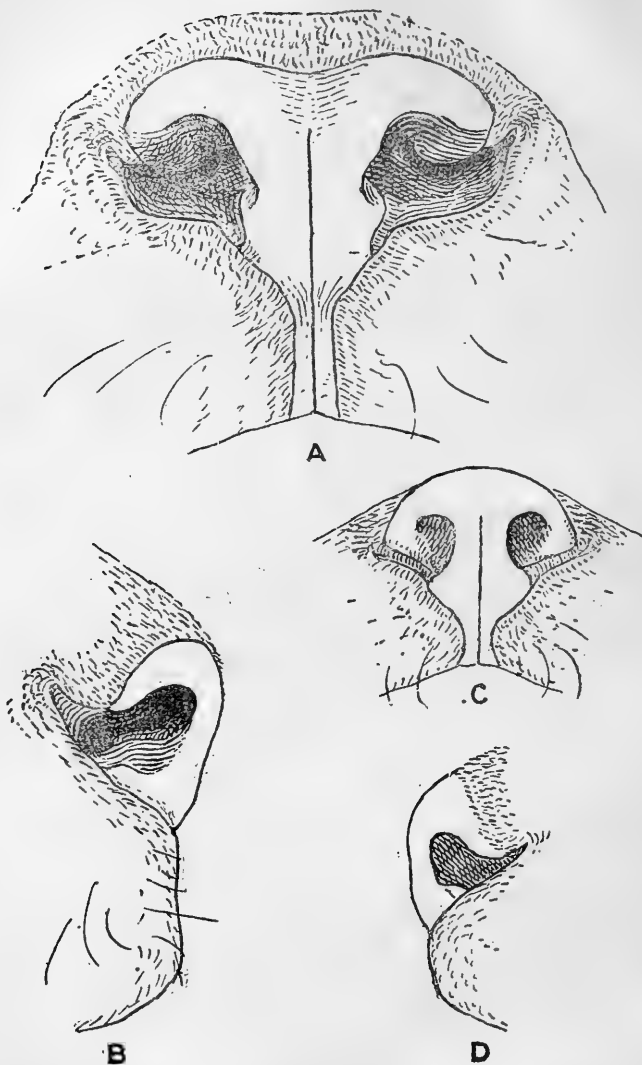
In *Panthera leo* (fig. 4, A, B) the short hair of the muzzle spreads over the summit of the rhinarium practically to its anterior margin, so that there is no naked area, or at most a very narrow naked area, visible in front of the hair from the dorsal view. The rhinarium itself is tolerably flat, the median area below the level of the nostrils is narrow and acutely angled inferiorly, and there is no definite lateral infranarial extension, the naked skin forming the lower margin of the nostril being quite smooth and moist like the inside of that orifice, which is large and expanded.

So far as my observations go, the rhinarium of *P. tigris*,

\* In the description of *F. braccata*, Cope records the angulation of the muzzle-hairs in *F. jaguarondi* (Amer. Nat. xxiii. p. 144, 1889).

† For the recognition and definition of this genus, see Ann. & Mag. Nat. Hist. (8) xviii. pp. 221-229 & 306-316 (1916).

Fig. 4.



- A. Rhinarium of *Panthera leo*, from the front.  
 B. " " " from the side.  
 C. " *Felis lynx*, from the front.  
 D. " " " from the side.



*onca*, and *pardus* agrees with that of *P. leo*. The rhinarium of *Uncia uncia* I do not know.

The foregoing account of the range of variation in the structure of the rhinarium in the Felidæ, and a comparison between that organ in the Felidæ and in genera referred to the Viverridæ, show that there is practically a complete gradation between the two.

In *Civettictis civetta*\*, for example, the rhinarium, which is of the same type as the rhinarium of *Paradoxurus* and of *Mungos*, is very large and prominent, with the infranarial portions deep and extending laterally beyond the nostrils. But in *Genetta* the infranarial portions are reduced in size; and in *Linsang*† they are so much reduced as to be only a little larger than in some of the Felidæ—e. g., *F. pardalis*, *F. eyra*, and *F. serval*, which also have the rhinarium tolerably prominent and naked above. The difference, indeed, between the rhinaria of *Linsang* and of *Civettictis* is greater than between the rhinaria of *Linsang* and *F. pardalis*; and from the prominent rhinarium, with its naked upper side, of *F. pardalis*, gradations may be traced within the Felidæ to the wide, comparatively flat rhinarium, with hairy upper side and suppressed infranarial areas, of *Panthera leo*, the species which, with its allies, has the highest type of rhinarium met with in the Æluroidea.

### The Facial Vibrissæ.

Amongst the Æluroid Carnivores, as I have already shown, the Felidæ are exceptional for the complete absence of the interramal tuft of tactile vibrissæ. At all events, I have never found a trace of this tuft in any specimen of the many species that have passed through my hands. For the rest, there is nothing particularly noteworthy about the facial vibrissæ. The mystacial and superciliary tufts are always well developed. The two genal tufts occupy the normal position on each cheek, the lower being placed in a line with the corner of the mouth, and the upper a little higher up and a little farther back than the lower. In species with short hair on the cheeks each tuft consists usually of two or three long vibrissæ and is very conspicuous, e. g. *Panthera pardus* and *F. caracal*. But sometimes there is a reduction in the number. Of two specimens of *F. wiedii*,

\* P. Z. S. 1915, p. 396.

† Ann. & Mag. Nat. Hist. (8) xvi. p. 341, pl. xii. fig. 5 (1915).

for instance, one had three bristles to each tuft, the other only one—a difference I suspect to be due to moulting. On the other hand, in species with long hair or copious whiskers on the cheek, like *Panthera tigris* and *Felis lynx*, these vibrissæ are not always easy to find. In an example of the Tibetan lynx, *F. lynx isabellina*, for instance, each of the genal tufts was represented by a single bristle mixed up with the fringe on the cheek. Similarly, in examples of *F. sylvestris* and of *F. ocreata*, recently examined, each the genal tufts was represented by a single bristle.

### *The Feet.*

In the 'Annals and Magazine of Natural History' (8) xviii. pp. 419–429 (1916), in a paper dealing with the external characters of the hunting leopard or cheetah (*Acinonyx jubatus*), I described the feet of that Feline, and compared them with those of the common leopard (*Panthera pardus*) to show the differences between them and to illustrate the range of structural variation in the feet within the limits of the family Felidæ. I stated that the feet of *Acinonyx* are distinguished from those of all the other members of that family by the complete absence of cutaneous sheaths for guarding the claws; but added that the feet of the typical Felidæ by no means always conform to the Pantherine type in the degree of development of these sheaths. In the following pages I have described and figured the feet\* of several species from the Old World and the New to show how they differ from each other. Since the selection is tolerably wide, it does not appear to me probable that any species of cat exists with feet differing in any important respect from all of those here discussed; but a few interesting species, like *F. manul*, *pajeros*, and *planiceps*, still remain to be done.

Since in their main characters the feet here described agree with those of *Panthera pardus*, it is needless to repeat what was said on that head in the paper above quoted†.

\* The drawings have been taken from measured feet with the hairs surrounding the pads cut short, and the feet are represented as naked with the digits spread, the axes of digits 2 and 5 being approximately at right angles.

† Apart from the forms assigned to *Panthera*, a genus which I have elsewhere defined, all the species are provisionally referred to the genus *Felis*.

## Genus FELIS, Linn.

*Feet of some European, African, and Asiatic Species.**Felis sylvestris*\*.—The feet are comparatively narrow for

Fig. 5.



- A. Left fore foot of *Felis sylvestris*.  $\times \frac{1}{3}$ .  
 B. " hind foot of " " "  
 C. Right fore foot of *Felis serval*. " "  
 D. " hind foot of " " "

their length, with smallish pads. In the fore foot the

\* It is appropriate to begin with this species, because it is closely related to, and probably one of the agriotypes of, the domestic cat, *Felis catus*, the type of the genus *Felis*. The feet of the two are similar. The examples of *F. sylvestris* examined came from Scotland.

second and third digits are provided with inner lobes to the claw-sheaths, that of the third being larger than that of the second. There is, however, no distinct inner lobe to the claw-sheaths of the fourth and fifth digits. The webs are moderately well developed. In the hind foot the digits are without inner lobes to the claw-sheaths, or, at all events, these lobes are so small as to be negligible (fig. 5, A, B).

*F. ocreata* has feet almost precisely like those of *F. sylvestris*.

*Felis serval*.—The feet in a general way resemble tolerably closely those of *F. sylvestris*, except that the sheaths of the claws are relatively a little larger, the inner lobe of the third digit in the specimen examined being exceptionally well developed and larger than the outer lobe. The carpal pad also is relatively larger (fig. 5, C, D).

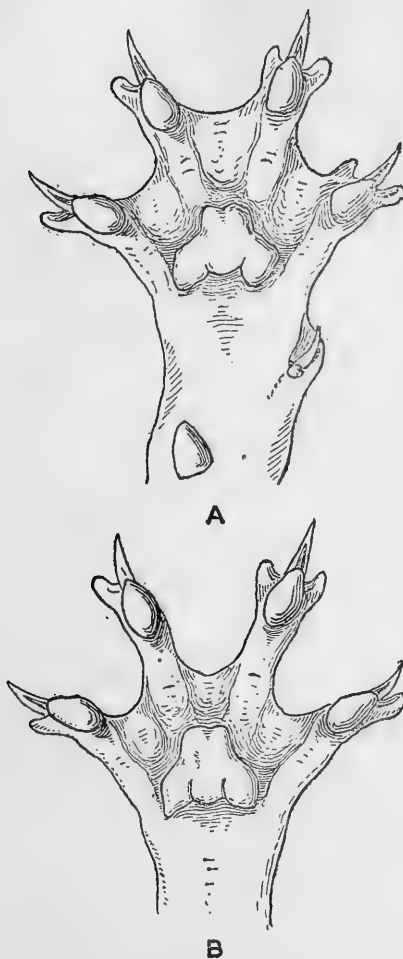
*Felis caracal*.—The fore foot is tolerably similar to that of *F. sylvestris*, but the digits are more separable, the claw-sheaths somewhat larger, and the webs, particularly those joining the second and third and the fourth and fifth digits, shallower and more emarginate. In the hind foot the third digit carries a well-developed inner lobe to the claw-sheath, the plantar pad is longer as compared with its width than in *F. sylvestris*, and the webs are much shallower, especially that connecting the third and fourth digits. The digital pads, also both of the fore and hind foot, are more pointed distally than in *F. sylvestris* and *F. serval* (fig. 6, A, B).

As I have already remarked (Ann. & Mag. Nat. Hist. (8) xviii. p. 429, 1916), the hind feet of *F. caracal* recall those of *Acinonyx jubatus* in the emargination of the webs.

*Felis lynx isabellinus* (fig. 7, C, D).—The feet differ in some interesting particulars from those of *F. caracal*. In the fore foot the plantar pad, owing to the encroachment of the surrounding hair, is shorter as compared with its width; the webs are deeper and hardly differ in development from those of *F. sylvestris* and *F. serval*; the claw-sheaths are exceedingly well developed on the second and third digits, the inner lobe of the third being approximately as large, relatively, as in *F. serval*, and there is a distinct inner lobe on the fourth and fifth digits, that of the fourth being large, that of the fifth smaller but distinct. In the hind foot the plantar pad is longer for its width than in the fore foot, but not so long as in *F. caracal*. The webs are rather more emarginate than in *F. sylvestris* and *F. serval*, but not nearly so shallow as in *F. caracal*. As in the fore foot the claw-sheaths are complete on all the digits,

the second, fourth, and fifth carrying an inner lobe as well as the third, that of the fifth being the smallest.

Fig. 6.

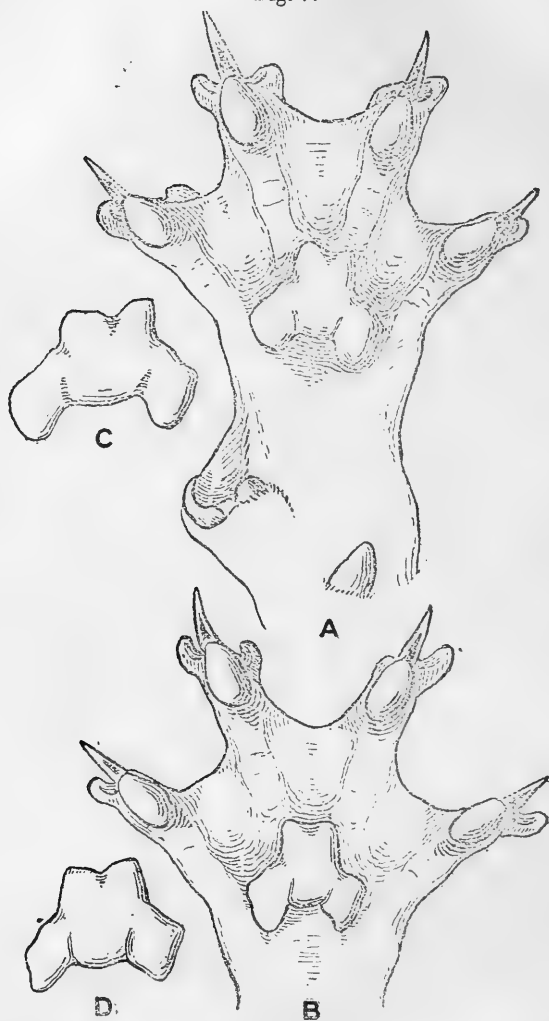


A. Right fore foot of *Felis caracal* (young).  $\times \frac{1}{3}$ .  
 B. " hind foot of " " "

*Felis viverrina*.—The feet are shorter and broader than in the previously-described species, and in the example examined

the carpal pad was exceedingly small. The claw-sheaths are moderately well developed, but the inner lobe of the second

Fig. 7.

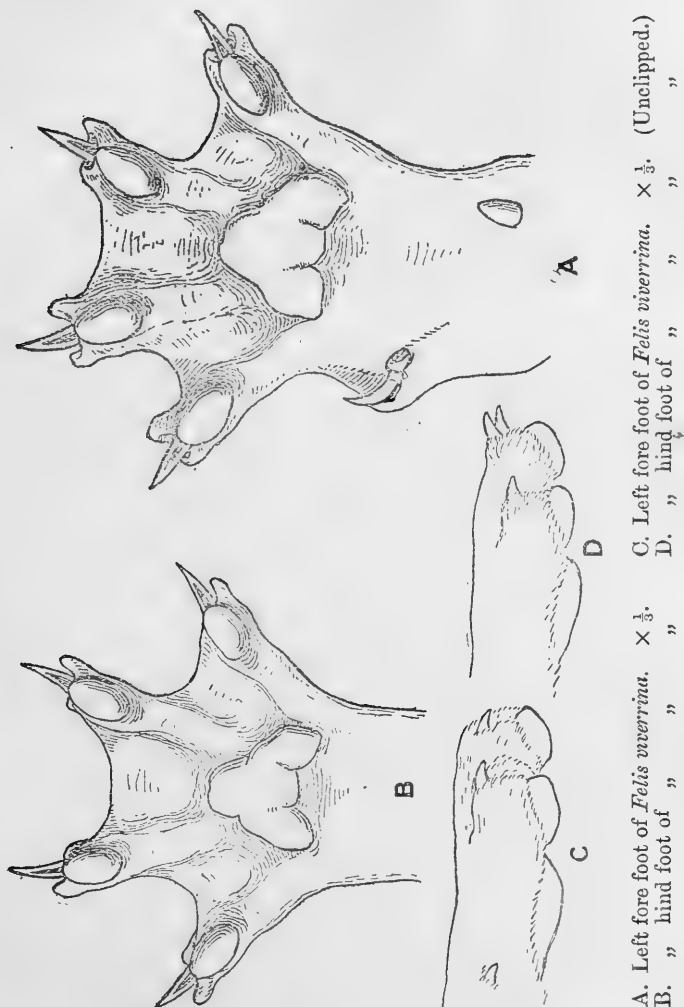


- A. Left fore foot of *Felis ruffus esquinae*.  $\times \frac{1}{3}$ .  
 B. " hind foot of " "  
 C. Plantar pad of right fore foot of "*Felis lynx isabellinus*".  $\times \frac{1}{3}$ .  
 D. " " hind foot of " " "

of the fore foot is comparatively large, and there is a small inner lobe on the fourth and fifth. Similarly, in the hind

foot there is an inner lobe, but a very small one on the second, third, and fourth digits. The webs are developed to approximately the same extent as in *F. sylvestris* and *F. serval*. They do not conceal the tips of the claws, which

Fig. 8.



project to a certain extent, even beyond the hairs of the toes, especially on the hind feet, as shown by the sketches of the unclipped feet (fig. 8, A, B, C, D).

*Felis nebulosa*.—The feet are very short and broad with large pads. In the fore foot the carpal pad is very large

Fig. 9.



A. Right fore foot of *Felis nebulosa*.  $\times \frac{1}{3}$ .  
 B. „ hind foot of „ „ „

and rounded at the apex, the webs are deep and extend approximately up to the distal ends of the digital pads, and



on all the digits the claw-sheaths are perfected by the development of inner lobes. In the hind foot the plantar pad is very broad, the webs are very nearly as deep as in the fore foot, and all the digits, as in the fore foot, have well-developed inner lobes (fig. 9, A, B).

The feet of this species differ from those of *F. viverrina* in the larger size of the pads, the much deeper webs, and the much better developed claw-sheaths. In all these respects they more resemble the feet of *Panthera* described below.

### *The Feet of some American Species.*

The feet of an American lynx, probably *F. ruffus esquinapæ* (fig. 7, A, B), from Tampico, resemble those of *F. lynx isabellinus* in web-development, but the inner lobes of the sheaths of the claws are relatively smaller, both on the fore and hind feet, and the plantar pads are differently shaped, being markedly longer as compared with their width. Thus the median length of these plantar pads is about three-quarters their total width. They are less overgrown by hair than in *F. lynx isabellinus*, and recall in their shape and proportions the posterior plantar pad of *F. caracal*.

It may be recalled that Bangs has already pointed out (Proc. Biol. Soc. Wash. xi. pp. 48, 49, 1897) that the plantar pads of the lynxes (*F. ruffus fasciatus*, etc.) of the more southern portions of North America are larger than those of the Canadian species (*F. canadensis*). Hence it may be inferred, I think, that the pads of *F. canadensis* probably resemble those of *F. lynx isabellinus*. The point, however, to be noticed here is that the three species of lynxes, namely, *F. caracal*, *F. lynx isabellinus*, and *F. ruffus esquinapæ* have feet of the same general form, and that those of the Mexican animal are approximately intermediate in character between the feet of *F. caracal* and of *F. lynx isabellinus* \*.

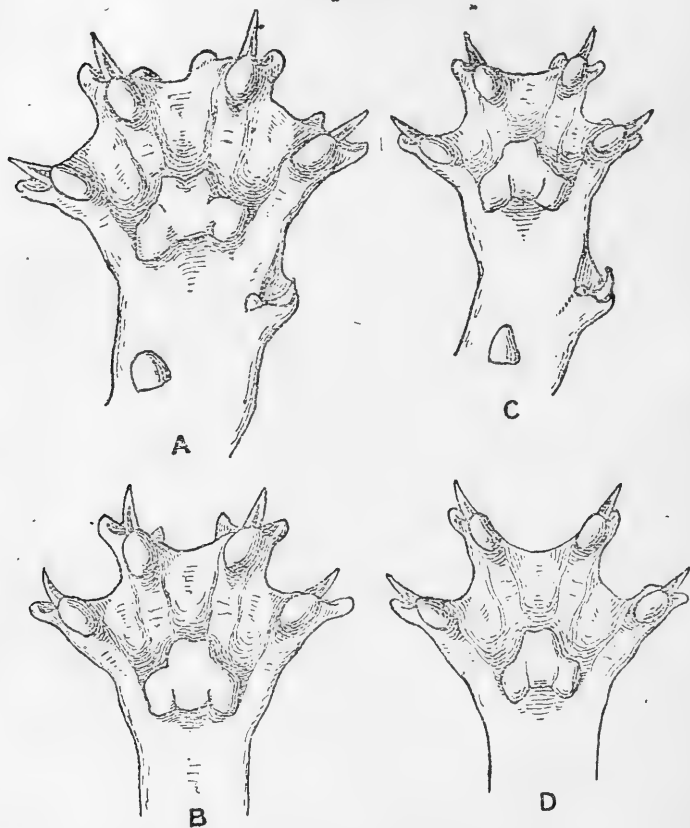
*F. geoffroyi*.—The feet are more robust than those of *F. sylvestris*, but are otherwise tolerably similar to them in the size of the pads and the development of the webs and of the claw-sheaths. The claw-sheaths are small. In the fore foot the inner lobe is negligible on the fourth and fifth digits, small upon the second and larger, but still small,

\* The Tibetan lynx has been referred to the subgenus which at present carries the inadmissible name *Eucervaria*. That is a mistake, the skull characters being those of the typical forms, *F. lynx* and *F. canadensis*.

upon the third; and in the hind foot the inner lobes are negligible upon all the digits\*.

*F. jaquarondi*.—In an adult example of the *F. eyra-* mutation from Cordova, in the Argentine, the fore foot is

Fig. 10.



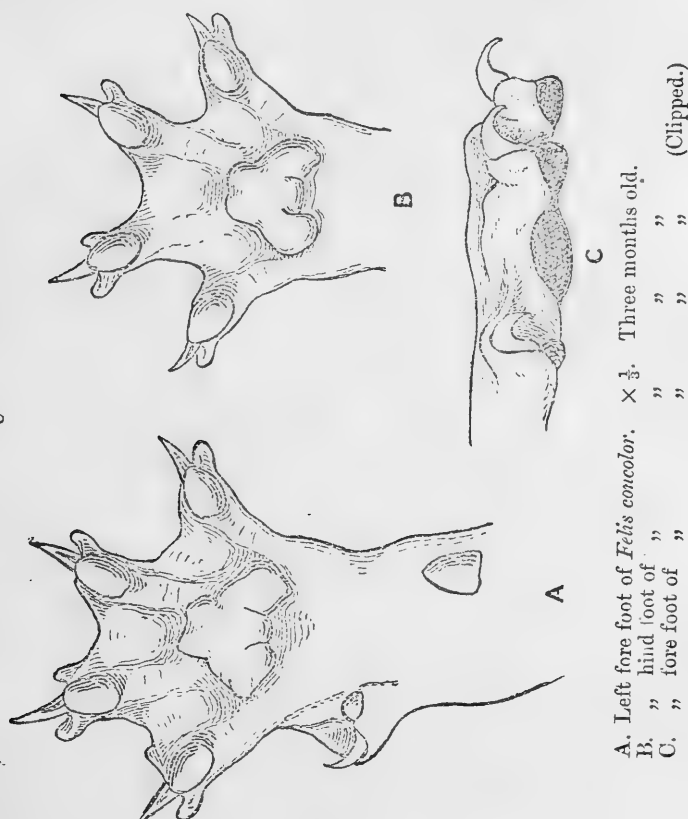
- A. Right fore foot of *Felis wiedii*.  $\times \frac{1}{3}$ .  
 B. " hind foot of " " "  
 C. " fore foot of *Felis salinarum*. " "  
 D. " hind foot of " " "

shorter than in the example of *F. geoffroyi* examined, has the pads relatively larger, and the claw-sheaths better

\* In all cats the edge of the skin upon the admedian or inner side of the claw is detached from the claw to a greater or less extent. Hence the rudiment of the inner portion of the sheath is always present, even in cases where it is stated to be negligible or absent in this paper.

developed, the inner lobes of the second and third digits being larger and a small one is present on the fourth. The webs, however, are developed to approximately the same extent. The hind feet of the two species are also approximately alike, except that in *F. jaguarondi* the claw-sheaths are a little larger and the third digit shows a small inner lobe. These differences, however, are less marked in a

Fig. 11.



kitten of the same type from Cordova and in one of the dark-coloured forms of which the locality is unknown.

In *F. salinarum* (fig. 10, C, D) the feet closely resemble those of *F. geoffroyi* and *F. jaguarondi*.

*F. wiedii* (*macroura*) (fig. 10, A, B).—The feet are broad and short, with moderately well-developed pads. In the fore foot the webs are very deep and extend approximately

up to the distal ends of the digital pads, as in *F. nebulosa*. The claw-sheaths also are well developed, with distinct inner lobe upon the second, third, and fourth digits; but this lobe is sufficiently small to be negligible upon the fifth digit. In the hind foot the webs are also well developed, although shallower than on the fore foot. The inner lobe of the claw-sheath is negligible upon the second and fifth, but well developed on the third and distinct though small upon the fourth digit.

*F. pardalis* has feet similar to those of *F. wiedii* (Ann. & Mag. Nat. Hist. (6) xviii. p. 428, fig. 5, A, 1916).

It is interesting to notice that the feet of *F. wiedii* and *F. pardalis* differ rather markedly from those of *F. geoffroyi*, *F. salinarum*, and *F. jaguarondi*, and also from those of *F. concolor*, though to a slightly less extent, in the development of the webs and of the claw-sheaths.

*F. concolor* (fig. 11, A, B, C).—In an example three months old the feet are shorter and broader than in *F. geoffroyi*, and provided with larger pads and better developed claw-sheaths. Nevertheless, the webs are developed to approximately the same extent, and the inner lobe of the claw-sheaths is small upon the second and third digits and negligible upon the fourth and fifth of the fore foot, and also negligible upon the second, fourth, and fifth of the hind foot. In neither foot do the sheaths encase the claws almost to the tip, and, in the extent to which the claws when retracted are exposed, the feet approximately resemble those of *F. geoffroyi*, *jaguarondi*, *viverrina*, and *sylvestris*, and do not conform to the type of foot of *Panthera* (fig. 12).

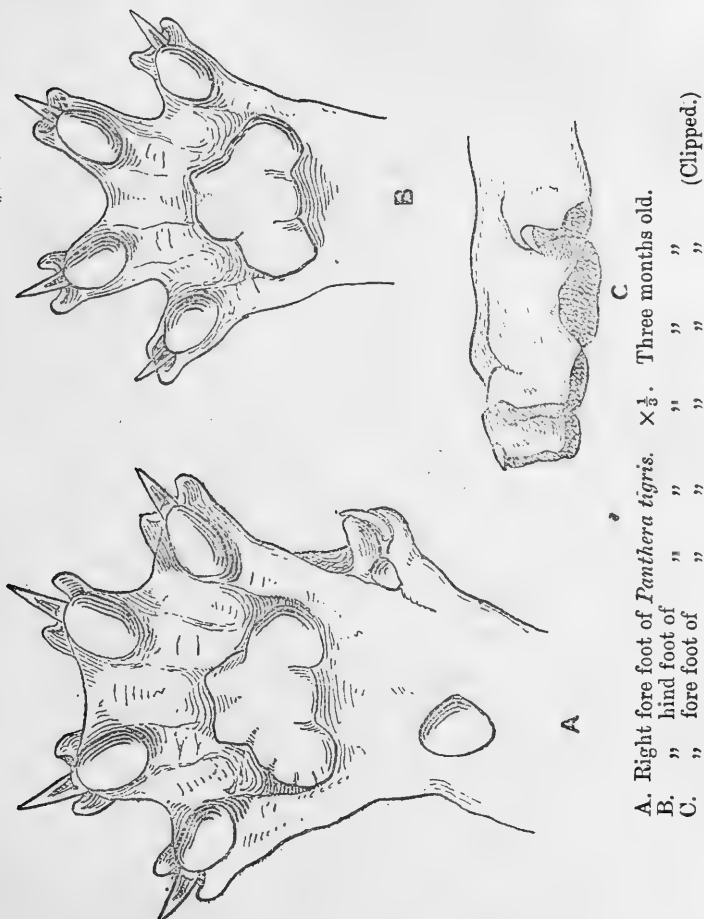
#### GENUS PANTHERA, Oken.

In the species of the genus *Panthera* (fig. 12) examined, namely, *P. pardus*, *onca*, *tigris*, and *leo*, the feet are very much alike. They are short, broad, compact, and difficult to spread. The plantar and digital pads are large and the sheaths are well developed, both upon the outer and the inner side of the claw, and almost conceal the tips of the claws when retracted. In the fore foot the carpal pad usually has a widely rounded apex, and the webs extend almost up to the tips of the digital pads, at least on the admedian side, and show only a shallow emargination when the digits are stretched. In the hind foot the webs are less extensive and more emarginate.

Fig. 12 depicts the feet of a specimen of *P. tigris*, three months old. The feet of *P. pardus* I have already figured (Ann. & Mag. Nat. Hist. (8) xviii. p. 424, 1916).

Similar, however, as are the feet of this genus, they do not differ in important points from those of *F. nebulosa*, a

Fig. 12.



species which has a more Pantherine skull than any species of *Felis* in the sense in which the latter term is used in this paper.

The facts above described show an interesting series of

gradations in the specialization of the feet of *Felis* in the following particulars:—

*Claw-sheaths*.—In their simplest form, as exemplified in *Felis sylvestris* or *F. geoffroyi*, these structures differ in no essential respects from those of some genera of Viverrinæ, like *Viverra* and *Genetta*.

In their most elaborate form, as exemplified in *Felis lynx*, *Panthera tigris*, and others, the inner lobes on all the digits are well developed and form claw-sheaths, complete externally and internally, but the extent to which they protect the tips of the retracted claws depends upon the degree of retraction of the claw-bearing phalanx by the elastic ligaments and upon the length of the sheaths themselves.

Between these two extremes every gradation in the development of the sheaths may be traced.

*Webs*.—The webs may, exceptionally, be very shallow, as in the hind feet of *F. caracal*, but in almost all cases they reach up to the proximal end of the digital pads, at least on their admedian side; but in other cases they extend beyond that point, and may, in the case of the front foot, reach practically to the distal end of those pads on the admedian side and exhibit only a slight emargination of the edge, as in *F. tigrina*, for example. In the hind feet the webs are always shorter than in the fore feet, but they exhibit a similar progressive series in development from species to species. In almost all cases well-developed webs are associated with well-developed claw-sheaths. A striking exception to this, however, is shown by the hind feet of *F. lynx*, where short and deeply emarginate webs accompany claw-sheaths, which are complete both externally and internally.

It is needless to compare the feet of the Felidæ with those of *Hyæna*, *Mungos*, *Galidia*, *Eupleres*, *Cryptoprocta*, *Nandinia*, *Paradoxurus*, and their allies. But a few genera of Æluroids, formerly included in the heterogeneous family Viverridæ, approach the Felidæ tolerably closely in the structure of the feet, and, at all events, in the development of claw-sheaths, have more "feline" feet than has *Acinonyx*. There is scarcely any difference, for example, between *Genetta* \* and many species of *Felis* in the extent to which the claws are retracted and guarded by cutaneous sheaths. The same may be said of the feet of *Linsang* and *Poiana* †. But in the structure of the plantar and carpal pads, the low-set pollex, and the presence of the hallux,

\* Proc. Zool. Soc. 1915, p. 136, fig. 3.

† Ann. & Mag. Nat. Hist. (8) xvi. pp. 342 & 345, pl. xii. (1915).

*Genetta*, *Poiana*, and *Linsang* have much more primitive feet. On the other hand, *Viverricula* has a single cordate carpal pad, a simple trilobed plantar pad, and a small pollex set almost as high as in many Felidæ. The hind foot, however, retains a small hallux; and it seems that the invariable presence of this digit is the only character that can be definitely affirmed as distinctive of the feet of the Viverrinæ (*Viverra*, *Viverricula*, *Civettictis*, and *Genetta*) when compared with those of the Felidæ\*.

### *The Anus and External Genitalia.*

The anus and the external genitalia, both in the male and the female, of the Felidæ present very little variation in structure. The anus itself opens in the centre of a circular area of naked skin, and in the female the skin immediately surrounding the vulva is naked or sparsely hairy; the perineal region between the two is short, hairy, and unmodified, and the clitoris is minute. In the male the perineal region is also hairy and unmodified, and the prepuce is situated close to the scrotum. The glans penis is short, subconical, usually armed with backwardly directed spiny papillæ, is boneless, or, at most, fortified with a small bone, and the urethra opens close to the tip.

In its short unmodified perineum, the shortness of the glans penis, and the closeness of the prepuce to the scrotum the ano-genital area of Felidæ resembles that of *Nandinia* and the Mungotidæ, and, so far as I am aware, of *Eupleres* and *Linsang*. My acquaintance with the area in *Eupleres* and *Linsang* is, however, restricted to the female, and I do not know whether the prepuce is close to the scrotum or not. *Fossa* is another genus about which very little seems to be actually known with respect to this region, except that the perineum is unmodified and that the prepuce, judging from dried skins, is situated far in front of the scrotum, a character which must be regarded as primitive in the Carnivora.

So far as this area is concerned, the Felidæ may be distinguished from *Nandinia* by the absence of the large scut-gland situated in front of the prepuce and vulva in that genus, from the Mungotidæ by the absence of the circum-anal glandular sac and the situation of the small urethral orifice at the tip of the glans penis instead of beneath it.

Of the remaining genera of Æluroids, the Viverridæ

\* Very exceptionally the hallux is present in the Felidæ. I have seen it in a lioness.

(*Viverra*, *Paradoxurus*, *Cynogale*, and their allies) have the perineal area provided with scent-glands, situated in the male between the scrotum and the prepuce, which are widely separated. In *Galidictis* and *Galidia* a similar gland is present at least in the female, the position of the prepuce being unknown. In the Hyænas there is a large sac, receiving the secretion of the anal glands, above the anus, the prepuce is far in advance of the scrotum, and the glans penis is long.

Finally, *Cryptoprocta*, which has even been referred to the same family as the Felidæ on account of the misleading character of its dentition, has widely different external genitalia and the anus opening into a large sac.

Thus, if we set aside *Linsang*, *Eupleres*, and *Fossa*, about which our knowledge is defective, it may be seen that the genito-anal area of the Felidæ possesses a combination of characters distinctive of this family of Æluroidæ.

VIII.—*On some new Mites of the Suborder Prostigmata living on Lizards.* By STANLEY HIRST.

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THE Acari described below are forms living on lizards, and, with the probable exception of *Pimeliaphilus tenuipes*, they are all true blood-sucking parasites. The species dealt with in this preliminary note will be figured and described in detail in a later paper on parasitic mites.

Genus PTERYGOSOMA, Peters.

*Pterygosoma persicus*, sp. n.

♀.—*Body* much wider than long. On each side of the anterior end of the *dorsum* there are two patches of very short plumose hairs; these patches being almost continuous with one another, the inner one consists of about 5–8 hairs, the outer of 8–16 hairs. Hairs on rest of *dorsum* very few in number; some distance behind the anterior patches of hairs there is a transverse row of four plain hairs, which are short and widely separated from one another; there are also two or three rather long fine hairs on each side near the margin; posteriorly there are two more pairs of short plain



hairs (one pair placed behind the other); finally, two pairs of short plumose hairs situated near the posterior margin, those of the inner pair being placed on either side of the genital aperture. On each side of the posterior margin there is a fringe of about nineteen or twenty very long hairs, which are quite fine, not being feathered or modified in any way. *Venter* with only four pairs of fine plain hairs, which are of moderate length. There is also a tuft of eleven very long fine hairs on each side of the genital aperture. *Legs* slender and of moderate length; coxæ unarmed, being furnished with long fine hairs.

*Length* of body .6 mm.; its width 1.15 mm.

*Hab.* Sixty miles north-west of Kermanshaw, Persia; a few specimens found under the scales of the tail of *Agama nupta*.

*Pterygosoma melanus*, sp. n.

♀.—This species is not so wide as compared with its length as is usually the case in the genus. On each side of the anterior end of the *dorsum* there is a band of short slender plumose hairs. Hairs on the rest of the *dorsum* very few in number and widely separated from one another; some distance behind the anterior margin there are two pairs of racket-shaped hairs arranged so as to practically form a transverse row, and a little further back there is another pair of similar hairs. Posterior margin furnished with a fringe of about 18–22 hairs, which are rather short and paddle-shaped, the basal portion being short and cylindrical, but the rest of the hair flattened so as to form a rather wide blade-like expansion, which is striated. Hairs on *venter* very few in number, a pair of short plain hairs being situated immediately behind the mouth-parts, and another pair of similar hairs in the middle of the body; posteriorly there are two more pairs of hairs, which have the distal end plumose. *Legs* slender and rather short; coxæ unarmed, being furnished with quite fine plain hairs.

*Colour* (spirit-specimens) usually black, but sometimes paler.

*Length* of body .72 mm.; its width 1.1 mm.

*Hab.* Deelfontein, Cape Colony; several specimens found under axillæ and ventral folds of neck of *Agama atra*. Klipfontein, Damaraland; two specimens found on the same host.

*Pterygosoma neumanni*, Berl.

*Hab.* Specimens from *Agama coloncrum*, Gooli Mountains, Somaliland.

It is probable that this mite is only a variety of *P. agamæ*, Peters.

## GECKOBIELLA, gen. nov.

*Body* long-oval, being much longer than wide. instead of wider than long as is the case in the genus *Pterygosoma*. *Scutum* absent. Numerous short plumose hairs are present on the *dorsum* and sides. *Venter* only furnished with very few hairs. Free portion of *peritreme* rather long and directed forwards. *Coxæ* not nearly so much fused together as is the case of *Geckobia* and *Pterygosoma*, and only furnished with fine hairs.

This new genus is founded for *Geckobia texana*, Banks; as will be seen from the details given above, it is more closely allied to *Pterygosoma* than to *Geckobia*, but differs from the former in the shape of the body, which is longer than wide, instead of the reverse, and in the structure of the *coxæ*, which are only slightly fused with one another.

*Geckobiella texana*, Banks.

*Hab.* Duval County, Texas; two adult specimens and numerous larvæ found on *Sceloporus spinosus*, var. *clarkii* (= *S. floridanus*).

## Genus GECKOBIA, Mègnin.

*Geckobia latasti*, Mègn.

*Hab.* We have specimens of this mite from Castelfusano, Ostia, and also from Lisbon and Seville. These examples were taken from between the toes of *Tarentola mauritanica*.

*Geckobia clelandi*, sp. n.

♀.—*Body* about as wide as long. Dorsal *scutum* well developed and much wider than long; it reaches its greatest width just before the posterior margin, being angular and salient at this point. The scutum is furnished with ten hairs, arranged in two transverse rows, an anterior row composed of four hairs (two being placed close together on each side) and a posterior row of six (three on each side of the scutum); these hairs are similar in structure to those on the rest of the dorsal surface, and are fairly

long. A short distance in front of the outermost hair of the hinder row there is a minute rounded structure, which possibly is an obsolete eye. Hairs on rest of dorsal surface fairly numerous, but not placed close together; they are mostly of moderate length and are club-shaped, the distal end being enlarged and plumose. Hairs on venter numerous, but not placed close together; most of them are much smaller than those on the dorsal surface, and have the distal end plumose but not distinctly enlarged; hairs at the sides and hinder end large and club-shaped, however. On each side of the vulva the integument forms a large conical process. Plumose hair on second segment of *palp*, slender, curved, and not very long. *Legs*. Hinder legs not swollen, but they are longer than the front ones. First coxa furnished with two long fine hairs, which are not plumose. Coxæ 2-4 each with two short hairs, which are plumose distally (sometimes there are three on the last coxa). There is a conspicuous club-shaped hair on the dorsal surface of the femora of the legs, and a similar but much smaller hair is present on the anterior surface of the first femur.

*Length* of body .64 mm.; its width .61 mm.

*Colour* red when alive (in spirit yellowish).

*Hab.* Sydney (ii.16) and Narabcen, New South Wales (14. xi. 15); specimens from *Gymnodactylus platurus* forming part of Dr. J. Burton Cleland's collection.

### *Geckobia indica*, sp. n.

♀.—*Body* much wider than long. *Scutum* transversely elongated, being very much wider than long; its posterior margin is divided into two rounded lobes by a distinct indentation in the middle. A minute eye is present on each side near the anterior margin. There are about 34-46 plumose hairs on the scutum, all of them being quite short, especially the posterior ones. Similar hairs are present in the middle of the *dorsum*. Hairs at sides and posterior end of moderate length, slender and blunt; apparently they are not plumose. Hairs of posterior tufts of moderate length. Anterior hairs on *venter* very short and indistinctly plumose. Hairs on rest of lower surface long, slender and pointed. Hairs on second segment of the *palp* quite slender and plumose. *Legs*. Posterior legs longer than the anterior ones, but not much stouter. Spurs on coxæ well developed, being large and stout; there is also a plumose seta on the trochanter and femur

of the fourth leg, but these setæ are much more slender than the coxal spurs.

*Length* of body ·24 mm.; its width ·375 mm.

*Hab.* Several specimens found under ventral scales of a gecko (*Hemidactylus gleadowi*) from Upper Sind.

*Geckobia papuana*, sp. n.

♀.—*Body* much wider than long. *Dorsum* furnished with numerous hairs. At the anterior end there are two groups, each consisting of six stout plumose hairs, which are not very long. Behind them there are numerous very short, pointed, plumose hairs. Hairs at sides and hinder end of body of moderate length, slender, and not distinctly plumose. Hairs of posterior tuft long. Eyes present, but very minute and inconspicuous. Hairs on venter numerous. Anteriorly there is a number of very short plumose hairs or spinules. The rest of the lower surface is densely furnished with hairs, which are shaped rather like long narrow spear-heads, being flattened dorso-ventrally and having the point long and narrow. Last pair of *legs* greatly swollen, the anterior pairs comparatively slender. Coxæ armed with stout spurs, which are curved and plumose; two spurs are present on the second coxa, two on the third, and three on the fourth. There is also a spur on the trochanter and femur of the fourth leg, that on the femur being placed on a large protuberance.

*Length* of body ·34 mm.; its width ·5 mm.

*Hab.* Specimens found under ventral scales of a gecko (*Gymnodactylus lousiadensis*) from German New Guinea.

*Geckobia malayana*, sp. n.

♀.—Closely allied to *G. papuana*, sp. n. *Body* much wider than long. *Dorsum* furnished with numerous hairs. Two groups, each consisting of five rather stout plumose hairs, which are not long, are situated at the anterior end of the body, and they are followed posteriorly at a short interval by a pair of similar hairs. Numerous very short plumose hairs, which are pointed, are present in the middle area of the dorsal surface. Hairs at sides and posterior end long, slender, and apparently not plumose. There is a minute but distinct eye on the outer side of the group of stout plumose hairs. Hairs of the posterior tuft very long and slender. *Venter* with numerous hairs. Immediately behind the coxæ there is a band of very short

pointed hairs or spinules; hairs on the remainder of the ventral surface long and very slender. *Legs* of fourth pair much larger and stouter than the others. There is the usual number of spurs on the legs; the one on the femur of the last leg is not situated on a protuberance.

*Length* of body .28 mm.; its width .49 mm.

*Hab.* Several specimens found on geckoes (*Gymnodactylus pulchellus*) from the Jalor Caves, Malay Peninsula.

*Geckobia boulengeri*, sp. n.

♀.—*Body* longer than wide and attaining its greatest width some distance behind the middle. *Scutum* distinct and almost triangular (wedge-shaped); the anterior margin is slightly concave and strongly salient laterally. Ten plumose hairs are present on the scutum, all of them being very short and stout; six of these hairs are situated close behind the anterior margin (almost forming a transverse line), three being placed on each side. Posteriorly there are two lateral hairs on each side, one being situated immediately behind the other on the margin of the scutum. A minute eye is present on each side on the salient portion of the anterior margin. Numerous short plumose hairs are present on the rest of the *dorsal surface*, the anterior ones being usually rather stout, blunt, and very short; the others are more elongated, however. Hairs at the sides and hinder end of the body slender, fairly long, and blunt; apparently most of them are not feathered. Hairs of the posterior tuft long. *Venter* with very numerous contiguous hairs, the anterior ones being short and plumose, the others of moderate length, fine, and not feathered. *Legs.* Anterior legs slender, those of the third pair considerably longer and stouter; whilst the fourth pair are also long and are greatly swollen. Short stout spurs similar to those present in *G. papuana* etc. are present on the proximal segments of the legs.

*Length* of body .47 mm.; its width .43 mm.

*Hab.* A number of examples found on a gecko (*Gehyra yunnanensis*) from Yunnan Fu, China.

*Geckobia socotrensis*, sp. n.

♀.—*Body* wider than long. *Scutum* absent. Anteriorly the *dorsum* is furnished with numerous very short plumose hairs, which are slender, pointed, and subequal in length, none of the anterior ones being enlarged. Hairs at sides and posterior end of body only of moderate length and

often sinuous; apparently they are not plumose. Hairs on *venter* flattened and scale-like as in *G. loricata*, Berl., but much narrower and more elongated (spindle-shaped), and sharply pointed posteriorly. Distal hair on second segment of *palp* short, fairly stout, and plumose. *Legs*. Coxæ furnished with the usual spurs, but they are blunt and not nearly so strong as in *G. loricata*; trochanters also with a short but rather stout seta. All the legs are of approximately the same thickness, the posterior ones being the longest.

*Length* of body .3 mm.; its width .37 mm.

*Hab.* A few specimens found under axillæ of a gecko (*Pristurus rupestris*) from Jena-Agahan, Socuotra.

### *Geckobia loricata*, Berl.

*Hab.* I have examined specimens of this species found under the ventral scales of specimens of *Tarentola mauritanica* from Lisbon and also from the Riviera.

### *Geckobia australis*, sp. n.

♀.—*Body* wider than long. *Scutum* absent. Hairs on the anterior two-thirds of the *dorsum* much more uniform both in size and distribution than in *G. loricata*, Berl., none of the front ones being enlarged, all being very short. Posterior hairs on *dorsum* of moderate length and sometimes plumose, but the feathering is rather difficult to see. Ventral hairs flattened and scale-like, most of them being spindle-shaped and pointed posteriorly; the posterior ones are more elongated, however. The hair on the dorsal surface of the *palp* is stout and plumose. Posterior *legs* longer and stouter than the anterior pairs, those of the fourth pair being considerably swollen. Coxal spurs large and curved; there is also a plumose seta on the posterior trochanters and on the femur of the fourth leg.

*Length* of body .36 mm.; its width .425 mm.

*Hab.* Several specimens found under ventral scales of a gecko (*Ilygodactylus capensis*), from Beira, Portuguese East Africa.

### Genus PIMELIAPHILUS, Trägårdh.

#### *Pimeliaphilus tenuipes*, sp. n.

♀.—*Body* oval, being much longer than wide. *Scutum* triangular, the anterior margin almost straight, being very slightly concave in the middle; the posterior end bluntly

pointed ; the scutum is furnished with six plumose hairs, a transverse row of four hairs being situated on the anterior margin ; the other two a little behind the middle of its length ; these hairs are quite long, being slightly longer than the scutum. Arrangement of hairs on dorsum the same as in *P. podapolipophagus*, Trägårdh, and *P. insignis*, Berl. First of all, there is an outer hair on each side situated on the same platelet as the eye, the latter being placed in front of the hair. There are also four longitudinal rows of slender plumose hairs, the outer rows each consisting of two long hairs and a shorter posterior hair, the inner rows each of three long hairs. On each side of the genital opening there are two hairs of moderate length and also an inner border of three short hairs. All these hairs on the dorsal surface are slender and plumose, and their sockets are not enlarged. Hairs on *venter* few in number ; there is a pair of short fine hairs between the last coxæ, followed posteriorly by three pairs of plumose hairs. Integument marked with a sculpturing of very fine wavy lines as in *P. podapolipophagus*. Projecting portion of *peritreme* short. *Chelicera* shaped very like that of the species of *Geckobia*, the basal part being short, compact, well defined, and strongly convex dorsally ; the rest of the chelicera forming a long slender style, which, apparently, is not bifid at the end as in the two known species of *Pimeliaphilus*, but ends in a single minute tooth or claw, which is slightly curved. *Palp* short : the basal segment is salient laterally and has a sharp prominent transverse ridge on its dorsal surface ; second segment dorsally with a long slender plumose hair ; the next two segments each with a shorter hair, which is very fine and apparently not plumose. *Legs* long and slender, and furnished with numerous fine plumose hairs. With the exception of the last, each of the coxæ has a pair of short hairs, the inner hair being fine and not plumose, the outer stouter and apparently plumose. There is also a forwardly directed plumose hair on the anterior surface of the third coxa.

*Length* of body .274 mm. ; its width .22 mm.

*Colour* (in spirit). Body red, but whitish anteriorly and marked with a pale central line both above and below. appendages pale.

*Hab.* A single example found on a gecko (*Gonatodes albogularis*), from Honda, Magdalene River, Colombia.

IX.—Cassidinæ and Bruchidæ [Coleoptera] from the Seychelles Islands and Aldabra. By S. MAULIK, B.A. (Cantab.).

THIS paper deals with the material of these groups obtained by the Percy Sladen Trust Expedition, in 1908-9, in the Seychelles Islands and Aldabra. Many of the results of this expedition have been published in special volumes of the Linnean Society's 'Transactions' (ser. 2, Zool. vols. xii.-xvii.), in which series the writer of the present paper has already reported on the Hispinæ of the Seychelles (vol. xvi. pp. 237-242, 1913).

Chrysomelidæ.

CASSIDINÆ.

This subfamily is represented by two species—*Hoplionota lila*, sp. n., and *Aspidomorpha apicalis*, Klug. The former is allied to certain Madagascar species, the latter is known from Madagascar and Africa. The only member of the group previously recorded from the Seychelles was *Coptocycla leopardina*, Boheman, known also from Madagascar and the Comoro Islands; but this was not obtained by the Percy Sladen Trust Expedition.

HOPLIONOTA, Hope.

1. *Hoplionota lila*\*, sp. n.

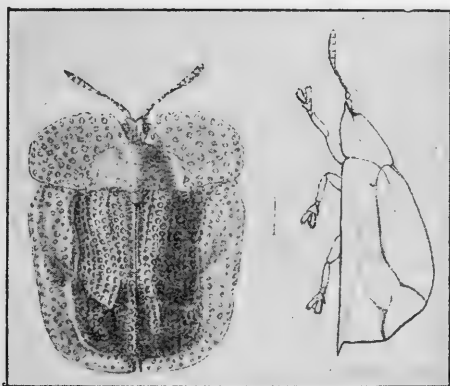
Quadrate, slightly narrowed behind; as seen in profile very convex behind the middle, from the highest point of the convexity a gentle slope towards the head and a sudden decline towards the posterior extremity; subnitid. Head, antennæ, prothorax with its lateral expansions, scutellum, the elytral expansions, and the underside orange-red. Eyes black. Basal half of elytra green, without costæ, apical half dark red. Elytra without spines or tubercles. Length 5 mm.; greatest breadth 4.5 mm.

*Head* not completely concealed under the pronotum, dorsal surface slightly depressed between the eyes; viewed dorsally the vertex is bilobed and slightly projecting; the antennæ are situated under the lobes. Eyes oblong-ovate. Antennæ: joint 1 elongate and distally thickened, joint 2

\* A Sanskrit word, used with reference to the green colour of the elytra.



small and rounded, joints 3-6 elongate and more slender, joints 7-11 form a dilated club which is covered with brownish pubescence. *Pronotum* twice as broad as long, front margin more or less serrated, lateral margins rounded; surface of disc uneven, impunctate; the lateral expansions with large and deep punctures, the centres of which are more or less hyaline. *Scutellum* triangular; apex rounded. *Elytra*: basal portion green, deeply and closely punctate, centres of punctures red; the green portion of each elytron is separated from the apical red portion by an oblique costa, one end of which terminates in a swelling at the middle of the lateral expansion, the other end joining with an irregularly-branched costa on the apical red portion of the elytron; costæ shining; the apical red portion of the elytra



*Hoplionota lila*, sp. n.

has the suture raised and is deeply and closely punctate; elytral expansions sparsely and deeply punctate, centres of the punctures more or less hyaline.

*Loc.* Seychelles: Mahé; Cascade Estate, ca. 800 ft., 1909 (*H. P. Thomasset*).

*Type* in the British Museum: described from one example.

*H. lila* is related to *H. thiemii*, Weise, *H. guerini*, Weise, and *H. marginata*, Boh., from Madagascar. All of these are without elytral spines or tubercles, and also have the basal portion of the elytra without any pronounced costa. *H. lila* differs from all the others by (1) the orange-red colour of the prothorax, scutellum, &c., (2) its larger size, (3) the proportionately greater length of the antennæ, (4) the

greater sloping of the elytra from the highest convex point, (5) the more pronounced character of the costæ on the apical portion of the elytra.

#### ASPIDOMORPHA, Hope.

##### 2. *Aspidomorpha apicalis* (Klug).

*Cassida apicalis*, Klug, Ins. Madag. 1833, p. 122; Boheman, Mon. Cassid. ii. 1854, p. 257.

*Cassida decolorata*, Boheman, Cat. Brit. Mus. ix. 1856, p. 144; id. Mon. Cassid. iv. 1862, p. 347.

*Cassida subeuropæa*, Thomson; Weise, Deutsche Ent. Zeitschr. 1896, p. 19; Kolbe, Abh. Senckenb. Naturf. Ges. xxvi. 1902, p. 584.

Var. *lutea*, Fairm., Bull. Soc. Ent. France, 1896, p. 223; Weise, in Voeltzkow, Reise in Ost-Afrika, ii. 1910, p. 504.

*Loc.* Seychelles: Mahé; Cascade Estate, ca. 1000 ft., i.-ii. 1909. Aldabra (*teste* Fairmaire and Kolbe). Known also from Madagascar and widely spread in Africa.

The specimens from Mahé are all from cultivated land. Several were found, together with a larva and a pupa, on the leaves of sweet potatoes (*Ipomœa batatas*) in Jan. 1909. After death most dried examples fade from green to a uniform light yellow.

#### COPTOCYCLA, Chevrolat.

##### 3. *Coptocycla leopardina*, Boheman.

*Coptocycla leopardina*, Boheman, Mon. Cassid. iii. 1855, p. 255; id.

Cat. Brit. Mus. 1856, p. 175; Fairmaire, Ann. Soc. Ent. Belg. xxxvii. 1893, p. 525; Alluand, Cat. Col. Région Malgache, 1900, p. 333.

Not obtained by the Percy Sladen Trust Expedition.

*Loc.* Seychelles (*teste* Fairmaire, *l. c.*). Madagascar, Comoros.

#### BRUCHIDÆ.

Apparently no member of this family has been recorded hitherto from any of the islands under review. Two species were collected by the Expedition—one in Seychelles, the other in Aldabra. According to Pic's 'Catalogue of Bruchidæ' (1913), both are Oriental.

#### PACHYMERUS, Thunberg.

*Caryoborus*, Schönherr.

##### 4. *Pachymerus gonager* (Fabr.).

*Loc.* Seychelles: Mahé, two specimens from Port Victoria, xii. 1908. East Indies (Pic, Catalogue, p. 7). The

British Museum contains specimens from Bombay, South India, Ceylon, and Java. Lefroy ('Indian Insect-Life,' p. 351) states that this insect is common in India, the larva living in the seeds, and the adult eating the leaves, of the tamarind: he refers also to the description of the life-history by Elditt (1860), who reared the beetle from pods of *Cassia*.

#### SPERMOPHAGUS, Schönherr.

##### 5. *Spermophagus convolvuli* (Thunberg).

*Loc.* Aldabra, xi. 1908 (Fryer), sixteen specimens, seven of which are stated to have been bred from fruits of *Evolvulus alsinoides*, Linn. Pic's Catalogue (p. 59) records the species from Ceylon, South Russia (introduced), and doubtfully from South Africa.

#### X. — Notes on *Fossorial Hymenoptera*. — XXVI. On the Genus *Homonotus*, Dahlb. By ROWLAND E. TURNER, F.Z.S., F.E.S.

##### Family *Psammocharidæ*.

##### Genus *HOMONOTUS*, Dahlb.

*Homonotus*, Dahlb. Hymen. Europ. i. p. 35 (1843) (nec p. 441, 1845).

*Wesmaelinius*, Costa, Prosp. Imen. Ital. ii. p. 46 (1887).

*Hemisalius*, Saussure, Grandidier, Hist. Madagascar, xx. p. 313 (1892).

This genus is poor in species, but has a wide range in the Old World, though apparently absent from America. It may be distinguished by the convex head, strongly hollowed behind; the clypeus prolonged and covering the mandibles; the long and somewhat flattened median segment, emarginate at the apex and with the apical angles produced into stout spine-like processes; by the bifid tarsal unguis; and by the cubitus of the hind wing originating beyond the transverse median nervure. Second and third joints of the flagellum subequal, short. The neurulation of the fore wing in the genus is variable, both in the proportion of the second and third cubital cells and in the length of the submedian cell, but the first recurrent nervure is received before the middle of the second cubital cell. As in many genera of the family there is a group of identical structure with only two cubital cells, the second transverse cubital nervure being absent. The species I have not seen are marked \*.

*Homonotus sanguinolentus*, Fabr.*Sphex sanguinolenta*, Fabr. Entom. Syst. ii. p. 211 (1793).*Salix dorsalis*, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 255 (1873). ♀.

This is the type of the genus and occurs throughout Europe, also ranging as far as Eastern Siberia. Though the thorax and median segment are usually red in the female, much variation exists in this respect, the female sometimes having the thorax and median segment wholly black.

*Homonotus ariadne*, Cam.*Pompilus (Ferreola) ariadne*, Cam. Mem. Manchester Lit. & Phil. Soc. (4) iv. p. 462 (1891).*Hab.* N.E. India; S. India; Ceylon; Tenasserim.\**Homonotus albistylus*, Sauss.*Hemisulius albistylus*, Saussure, Grandidier, Hist. Madagascar, xx. p. 315 (1892). ♀.*Hab.* Madagascar.

Evidently very closely allied to *ariadne*, having the same nervure at the base of the first cubital cell.

*Homonotus exulans*, Turn.*Pedinaspis exulans*, Turn. Proc. Zool. Soc. London, p. 338 (1910). ♀.

I doubt if this is more than a geographical race of the Indian *Homonotus ariadne*, Cam., but the spines at the apical angles of the median segment are distinctly longer and more acute in Australian specimens.

*Hab.* Mackay and Kuranda, Queensland; February to June.*Homonotus nudiventris*, Turn.*Pedinaspis nudiventris*, Turn. Proc. Zool. Soc. London, p. 339 (1910). ♀.

This differs from *exulans* in the colour of the wings and nervures, and in the much shorter and blunter spines at the apical angles of the median segment.

Both species and also *H. ariadne*, Cam., have the submedian cell of the fore wing as long as the median, not a little shorter as in the European *H. sanguinolentus*, Fabr. The first cubital cell is also pointed at the base, projecting towards the base of the wing a little beyond the basal nervure, in this also differing from *sanguinolentus*.

*Hab.* Mackay, Queensland; October.

This may prove to be a seasonal form of *exulans*.

*Homonotus ægyptiacus*, Rad.

*Wesmaelinus ægyptiacus*, Rad. Bull. Soc. Natural. Moscou, p. 473 (1888). ♂.

A male in the British Museum from Uganda answers well to the description, but has the greater part of the femora, as well as the tibiæ and tarsi, ferruginous; the apex of the abdomen is red from the middle of the third segment. With this I associate a female from North Rhodesia in which the legs are black, the calcaria whitish, and the abdomen red from the base of the third segment. The submedian cell in this species is slightly longer than the median.

*Hab.* Mt. Kokanjero, S.W. of Elgon, 6000 ft., Uganda (S. A. Neave), August; 70 miles west of Kariba Gorge, N. Rhodesia (*Silverlock*), June.

I assume that this is the species described by Radoszkowski, being the only species of the genus with similar colouring known to me. I have, however, seen a species more nearly allied to *Planiceps* in which the three apical segments of the abdomen are red in the female; but this has a short clypeus and the tarsal ungues are bidentate near the base, and I do not think it can have been mistaken for a *Homonotus*. It was taken at Harar.

*Homonotus nursei*, sp. n.

♀. Nigra; mandibulis fusco-ferrugineis; antennis fuscis, subtus fusco-testaceis; clypeo apice, tegulisque testaceis; pedibus fuscis; tarsis pallide ferrugineis, articulo basali basi, calcaribusque albidis; alis hyalinis, venis basi testaceis, apice fuscis.

Long. 4-6 mm.

♀. Clypeus produced over the mandibles, very broadly rounded at the apex; second and third joints of the flagellum subequal. Front strongly convex, temples very narrow, the eyes nearly reaching the hind margin of the head. Posterior ocelli very far apart, about four times as far from each other as from the eyes. Pronotum scarcely longer than the mesonotum, much broader than long, narrowed anteriorly. Median segment emarginate posteriorly, the apical angles produced into stout and rather blunt spines. First and second abdominal segments about equal in length, the basal half of the second dorsal segment rather thinly covered with very short grey pubescence. The longest calcar of the hind and intermediate tibiæ a little longer than the basal joint of the tarsi. First cubital cell narrowly rounded at the base; submedian cell a little shorter than the median; third abscissa of the radius longer than the second; first recurrent nervure

received at about one-third from the base of the second cubital cell, second just before the middle of the third cubital cell. Cubitus of the hind wing originating beyond the transverse median nervure.

*Hab.* Deesa, W. India (*Nurse*) ; April.

This is a smaller species than *albocalcaratus*, Rad., and has the third cubital cell longer than the second, not shorter as in that species ; the colour of the antennæ and tarsi is also different.

*Homonotus albocalcaratus*, Rad.

*Wesmaelinus albocalcaratus*, Rad. Bull. Soc. Natural. Moscou, p. 472 (1888). ♀ ♂.

A single male in the British Museum from Karachi (*Comber*) corresponds fairly well with the description, but the wings are hyaline, not infusate, and the clypeus is broadly rounded at the apex, not subemarginate ; but I am inclined to look on the latter as a sexual difference.

*Hab.* Orenburg ; Caucasus ; Siberia.

\**Homonotus caucasicus*, Rad.

*Wesmaelinus caucasicus*, Rad. Bull. Soc. Natural. Moscou, p. 472 (1888). ♀.

*Hab.* Caucasus.

\**Homonotus transcaspicus*, Rad.

*Wesmaelinus transcaspicus*, Rad. Horæ Soc. Ent. Ross. xxvii. p. 60 (1893). ♀.

*Hab.* Merv.

\**Homonotus steini*, Schulz.

*Homonotus affinis*, Stein, Berlin. ent. Zeit. iii. p. 63 (1869) (nec *Pompilus affinis*, Ev. = *H. sanguinolentus*, Fab.).

*Pompilus steini*, Schulz, Spolia Hymen. p. 168 (1906).

*Hab.* S.E. Hungary.

Doubtfully distinct from *sanguinolentus*.

\**Homonotus costæ*, Tourn.

*Wesmaelinus costæ*, Tourn. Entom. Genév. i. p. 156 (1889). ♀ ♂.

*Pompilus wettsteini*, D. T., Cat. Hym. viii. p. 336 (1897).

*Hab.* Sicily.

Subgenus GILBERTELLA, nov.

Differs from *Homonotus* in having only two cubital cells, the second transverse cubital nervure being absent.

Type of the subgenus, *Planiceps umbraticus*, Turn.

*Homonotus (Gilbertella) umbraticus*, Turn.

*Planiceps umbraticus*, Turn. Proc. Zool. Soc. London, p. 337 (1910). ♀.

The second cubital cell is very long, receiving the recurrent nervures near the base and near the apex. As in other Australian species of *Homonotus*, the base of the first cubital cell emits the stump of a nervure into the median cell. The submedian cell is a little shorter than the median. Calcaria of the intermediate and hind tibiæ very long, slightly exceeding in length the basal joint of the tarsi.

*Hab.* Mackay, Queensland; January and February.

*Homonotus (Gilbertella) disparilis*, sp. n.

♂. Niger; antennis subtus, tibiis anticis intermediisque subtus, tarsisque fusco-ferrugineis; calcaribus albidis; alis fusco-hyalinis, venis nigris.

Long. 5 mm.

♂. Clypeus very broadly rounded at the apex, covering the mandibles; second and third joints of the flagellum subequal; front shining, moderately convex. Posterior ocelli about twice as far from each other as from the eyes; temples very narrow. Pronotum narrowed anteriorly, scarcely as long as the mesonotum; median segment a little longer than broad, emarginate at the apex, the apical angles produced into long stout spines. Second abdominal segment a little longer than the first; the two apical ventral segments strongly compressed laterally. The longest calcar of the hind and intermediate tibiæ not quite as long as the basal joint of the tarsus; hind tibiæ moderately spinose; tarsal unguis rather feebly bifid near the apex. Two cubital cells; the second abscissa of the radius twice as long as the first; the recurrent nervures received at one-quarter from the base and at one-quarter from the apex of the second cubital cell; second transverse cubital nervure received just before the middle of the radius. Submedian cell distinctly longer than the median; cubitus of the hind wing originating far beyond the transverse cubital nervure.

*Hab.* Mlanje, Nyasaland (*S. A. Neave*); May.

The second cubital cell is much shorter than in *umbraticus* and the recurrent nervures are received much nearer together. In *umbraticus* the second transverse cubital nervure is received just before two-thirds from the base of the radius. The spines at the apical angles of the median segment are longer in this species than in any other known to me.

XI.—*Notes on the Species of the Genus Cavia.*  
By OLDFIELD THOMAS.

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THE genus *Cavia* ranges from Venezuela and Guiana in the north of South America to the pampas of Buenos Ayres in the south, and extends across the whole breadth of the continent, from Peru to Pernambuco.

Any examination of the species that exist in this area, and their correct names, has been rendered very difficult by the occurrence of such widely different specimens in the same areas, on which account I have long hesitated to attempt to work out this puzzling group. Definite cranial characters seemed almost non-existent, and one appeared to be reduced to distinguishing the local forms purely by average differences of size and shades of colour in a group where there is not a great range in either.

On taking up the subject afresh, however, I find that one character, observed by Lund in 1838, but overlooked ever since, definitely and sharply separates the smaller Brazilian species from the larger; and then, these smaller forms being laid on one side, the whole problem immediately becomes simplified.

This character is the possession by *Cavia fulgida*, the smaller Brazilian cavy, of a deep outer re-entrant angle or notch at the front end of the posterior lobe of  $m^3$ \*, this angle being quite shallow in the larger forms. This notch is so deep and well defined that there is practically never any case where one is doubtful as to the allocation of an individual skull.

When writing about the group in 1901†, I recognized *Cavia fulgida* (under the name of *rufescens*) by its smaller size, but, not knowing of the tooth-character, I erroneously made the small Argentine "quiso" a subspecies of it. Now, however, it is evident that there is no special relationship between the two.

Taking first the ordinary species without the extra molar notch, and going from north to south on the Eastern non-Andean part of the continent, we have in Guiana

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\* Figured by Lund, K. Dansk. Vid. Selsk. viii. pl. xxv. fig. 15.

† Ann. & Mag. Nat. Hist. (7) viii. pp. 532-534 (1901).



*Cavia guianæ*, Thos.

*C. porcellus guianæ*, Thos. Ann. & Mag. Nat. Hist. (7) viii. p. 152 (1901);

and in Venezuela

"*Cavia porcellus venezuelæ*," All. Bull. Am. Mus. xxx. p. 250 (1911), whose distinction from *guianæ* appears most doubtful.

As regards *guianæ*, the original statements about its characters were largely influenced by the fact that at that date the few available Brazilian specimens included both *aperea* and what we now know to be the quite distinct species *fulgida*. As a matter of fact, *guianæ* has practically the same colour as the real *aperea*, but is distinguished by its smaller size, the largest of three full-grown shells only measuring 63 mm. in length\*, with length of bulla † 11·8 mm. and upper tooth-row 14. The skull is proportionately rather broadly built, with unusually developed postorbital projecting ledges.

Specimens are in the British Museum from the Kanuku Mountains, Berbice, and the Moon Mountains, all in British Guiana.

Putting aside the *Cavia porcellus* of Linnæus, based on the *Cavia cobaya* of Marcgrave, the domesticated guinea-pig, to which the name should be restricted, we next have

*Cavia aperea*, Erxl.

*Cavia aperea*, Erxl. Mamm. p. 348 (1777) (based on the "*Aperea*" of Marcgrave, Bras. p. 223, 1648).

*Anama hilaria*, Geoff. N. H. Mamm. (fol.) ii. text to pl. 282 (1820).

*Cavia leucopyga*, Brandt, Mem. Ac. Petersb. 1835, p. 436, pl. xvi.

Size largest of the genus. General colour grizzled brownish grey, not the clearer or more olivaceous grey of the Argentine forms. Below dull whitish or drabby whitish, a clear white spot generally present on the middle line of the chest just behind the brown collar.

The largest of the available skulls measures no less than 73 mm. in total length, while the average of half a dozen from Minas Geraes and São Paulo is 68·7 mm. in total length, bulla 11·9, tooth-row 15·5. The hind foot in adults varies from 45 to 50 mm.

\* The skull-length is here always taken from the tip of the nasals, and may sometimes be slightly exceeded by a slanting length from occipital to gnathion.

† Measured from the notch in front of the paroccipital process directly forwards, parallel with the axis of the skull, not to the antero-internal angle, which ends in an irregular point.

Range from Pernambuco to São Paulo; inland to Minas Geraes. Specimens in Museum from Bahia (*Zoological Society*); Rio Jordao, Minas Geraes (*Robert*); Alambary and Ypanema, São Paulo (*Robert*); and Victoria, São Paulo (*Hempel*). Recorded by Lund from Lagoa Santa.

The Paraguayan cavy is so similar to *C. aperea* that I should probably not have distinguished it, but, as it has a name, it may provisionally stand as

*Cavia aperea azaræ.*

*Cavia azaræ*, Wagn., Schr. Säug., Supp. iv. p. 63, footnote (1843).

Colour, as represented by fresh skins, very much as in true *aperea* or rather more olivaceous; size averaging slightly less, though individual specimens overlap. Averages of four skulls in greatest length 65·8 mm.; bulla 12·4; tooth-row 14·9. The bullæ would, therefore, appear to be rather larger, but the number of specimens is not enough to indicate this with certainty.

*Hab.* Paraguay. Several specimens from Sapucay (*W. Foster*).

Next southwards from *C. aperea*, in the province of Parana, a special form was discovered by M. Robert, which may be described as follows:—

*Cavia rosida*, sp. n.

Size less than in *C. aperea*, greatest length of skull about 62 mm. General colour saturate, comparatively dark, nearly as much so as in *C. fulvida*. Upper surface grizzled "mummy-brown"; median area of back heavily blackened with long blackish piles, especially posteriorly, the middle of the lumbar region being nearly black. The blackening is, however, variable and occasionally almost absent. Under surface dull cinnamon-buff, the hairs pale grey basally; usual throat-markings scarcely distinguishable, the interramia buffy, the usual dark collar overlaid with dull buffy, and the white chest-patch either absent or reduced to a small spot. Inner side of limbs like belly.

Skull, as compared with that of *C. aperea*, smaller and with conspicuously shorter and slenderer muzzle—in fact, the skull, apart from the muzzle, is scarcely or not smaller than that of *aperea*, the difference in the whole length being almost entirely due to the reduction of the rostrum. Post-orbital projections not heavily developed. Bullæ fairly large.

Dimensions of the type:—

Head and body 395 mm.; hind foot 46; ear 20.

Skull: greatest upper length 62; condylo-incisive length 58; zygomatic breadth 35; nasals  $19.7 \times 8.5$ ; interorbital breadth 12.6; breadth of parietals across brain-case 24.5; diastema 17.4; bullæ  $12.2 \times 9.3$ ; upper tooth-series 14.6.

*Hab.* Serra do Mar, Eastern Parana. Type from Roça Nova. Alt. 1000 m.

*Type.* Adult female. B.M. no. 3.7.1.96. Original number 831. Collected 6th September, 1901, by Alphonse Robert. Six specimens.

This cavy of the Serra do Mar is readily distinguishable from *C. aperea* by its dark colour, blackish back, buffy belly, reduced chest-markings, and by the short and slender muzzle of its skull. In the lowlands of the same region, at Morretes (10 m.), M. Robert found a representative of the *C. fulgida* group.

Next comes the well-known quiso of the Argentine and Uruguay:—

*Cavia pamparum*, Thos.

*Cavia rufescens pamparum*, Thos. Ann. & Mag. Nat. Hist. (7) viii. p. 538 (1901).

Allied to *C. aperea*, but smaller; the skull usually about 62–63 mm. in length when adult. Colour as in *aperea*, but distinctly more greyish or olivaceous, less brown. Under surface whitish or slightly drabby, the chest-pattern well marked.

Skull shaped as in *aperea*, but smaller; the muzzle of the same general proportion, not reduced as in *C. rosida*.

Range from Corrientes and Uruguay southwards to Southern Buenos Ayres. Specimens in Museum from "20 miles north of Corrientes" (*Turner Henderson*); Goya, Corrientes (*R. Perrens*); Maldonado (*Darwin*); La Plata (*Thomas*); Los Yngleses, Ajó, Buenos Ayres (*E. Gibson*); and Bonifacio, S.W. Buenos Ayres (*R. Kemp*).

All the specimens from the above considerable range agree very closely with each other in size and colour, no geographical variation being observable. Two of Mr. Gibson's Ajó specimens, however, out of seven are abnormally larger than the others, with decidedly larger skulls; but these appear more or less diseased, and it is possible that they represent an infusion of domestic guinea-pig blood, although there is no colour indication of this. The other specimens of the same lot are quite like the ordinary quiso. The size of the bulla is a little variable, two of the Bonifacio series having this 12.1 and 11 mm. in length, that of the type being 11.7.

Passing now to the cavies of the Andean countries, Peru and Bolivia, we have first to identify *Cavia cutleri*, Bennett, the earliest name connected with that region.

The type-specimen, with imperfect skull, is in the British Museum—no. 53. 8. 29. 2,—and I have carefully examined it and compared it with the other material in the collection. It is a melano, and on this account its colour has never been able to be used for purposes of identification, while, although called a “Peruvian cavy,” its original locality has always been doubtful.

The conclusion I come to is that it is a domesticated guinea-pig—*Cavia porcellus*, L.,—its skull being too large for any Peruvian wild species, while it is closely matched by examples of *C. porcellus*, among which, of course, black specimens are by no means infrequent.

With this troublesome name removed, the ordinary Peruvian cavy should bear the name of

*Cavia tschudii*, Fitz.

*Cavia cutleri*, Tschudi, Fauna Peruana, p. 195 (1845).

*Cavia tschudii*, Fitzinger, SB. Ak. Wien, lvi. pt. i. p. 154 (98 in separates) (1867).

with type-locality Iça, on the coast, where Tschudi saw the specimens he described.

The species is comparatively small, the skull about 58 to 62 mm. in length, and with small bullæ. In colour it is coarsely grizzled cinnamon, buffy or greyish, and the under-side varies from strongly buffy to nearly white.

These variations appear to indicate four subspecies, as follows:—

*Cavia tschudii atahualpæ*, Osgood.

*Cavia atahualpæ*, Osgood, Field Mus. Publ. x. p. 98 (1913).

Size fairly large, the bullæ larger than in the more southern forms. Colour dark, “evenly grizzled cinnamon and blackish, the bases of the hairs dark drab followed by two or more annulations of cinnamon and blackish”; back, and especially rump, with numerous longer black hairs; under surface more or less cinnamon or buffy. Length of type-skull 60 mm.

*Hab.* N. Peru: Cajamarca.

No Peruvian cavies that I have seen have more than one light annulation on the hairs; but, even if there is no mistake in the observation, I should not consider it sufficient reason

to distinguish the North-Peruvian cavy specifically from *C. tschudii*, in view of its general agreement in size and other characters.

*Cavia tschudii umbrata*, subsp. n.

Size as in *atahualpæ*. Colour greyer throughout, the light rings on the hairs whitish instead of cinnamon or buffy.

Median area of back blackish, the darkening being effected not by overlaying with long black hairs, as in *atahualpæ* and *rosida*, but by the reduction of the light rings on the hairs, these being often barely 1 mm. in length, while those in the other subspecies are about 2–4 mm. as is usual. Bases of hairs pale slaty. Under surface soiled drabby, the belly and submaxillary lines of this colour; collar and middle line of chin greyish brown. Hands and feet pale brown, lighter on digits.

Skull of average proportions, the bullæ longer than in the two following subspecies.

Dimensions of the type:—

Hind foot 42 mm.; ear 20.

Skull: greatest length 60; condylo-incisive length 58; greatest breadth 57·7; nasals  $20\cdot5 \times 8$ ; diastema 18·2; bulla  $11\cdot8 \times 9$ ; upper tooth-series 13.

*Hab.* Junin, Central Peru. Type from Incapirca, Zezioro.

*Type.* Adult female. B.M. no. 94. 8. 6. 23. Collected 20th June, 1890, by J. Kalinowski.

This Junin subspecies agrees with *atahualpæ* by its darkened back, rather larger size, and larger bullæ, as compared with the two more southern forms that follow. From *atahualpæ* it differs in general colour very much as *pamparum* differs from *aperea*, and also in the details of the dorsal darkening.

*Cavia tschudii tschudii*, Fitz.

General colour fairly dark, strongly grizzled, the light rings on the hairs buffy or cinnamon. Under surface more or less strongly buffy. Median area of back not darkened.

Skull-length about 59–61 mm.; bullæ rather smaller than in the previous subspecies, 10·1–10·9 mm. in length.

*Range.* Middle Peru, from Ica to Cuzco.

The type-locality is Ica, and a specimen from Tambo, on the coast opposite Arequipa, agrees so precisely with the description as to be undoubtedly the same form. Four specimens from Urubamba, Cuzco, collected by O. Garlepp, agree absolutely with that from Tambo, while three from La Raya Pass, collected recently by E. Heller, are rather

greyer and more or less intermediate between this subspecies and the next; they are, however, all immature.

*Cavia tschudii pallidior*, subsp. n.

Similar in general characters to *tschudii*, but colour much lighter, the pale rings on the hairs a paler buffy, and the under surface a pale creamy buff approaching whitish. Collar a paler grey. Hands and feet buffy whitish, a little browner proximally.

Skull as in *tschudii*.

Dimensions of the type (measured in flesh):—

Head and body 242 mm.; hind foot 24; ear 29.

Skull: greatest length 59·5; condylo-incisive length 54; zygomatic breadth 33·5; nasals  $20\cdot3 \times 8\cdot7$ ; diastema 16·6; bulla  $10\cdot2 \times 8$ ; upper tooth-row 14.

*Hab.* Arequipa. Type from 2500 m.

*Type.* Adult male. B.M. no. 0. 10. 1. 85. Original number 1023. Collected 31st May, 1900, by P. O. Simons. Presented by Oldfield Thomas. Six specimens.

Distinguished from *tschudii* by its lighter coloration throughout.

*Cavia nana*, sp. n.

A pigmy cavy, conspicuously smaller than any other species of the group.

Size very small, skull-length only about 52 mm. Colour about as in *C. tschudii pallidior*, the light rings on the hairs buffy or pale cinnamon; no darkening along the median area of the back. Under surface creamy whitish, the grey collar well marked. Hands and feet pale brown.

Skull about as in *C. tschudii*, but conspicuously smaller. Bullæ especially small.

Dimensions of the type (measured in flesh):—

Head and body 215 mm.; hind foot 38; ear 23.

Skull: greatest upper length 52; condylo-incisive length 47; greatest breadth 29·5; nasals  $17\cdot5 \times 7\cdot5$ ; interorbital breadth 10·5; breadth of brain-case 22; diastema 13·7; bulla  $9\cdot5 \times 7\cdot5$ ; upper molar series, crowns 11·8, alveoli 12·5.

*Hab.* Highlands of Bolivia. Type from Chulumani, Yungas, 2000 m. Another specimen from the Desaguadero River (*J. B. Pentland*).

*Type.* Adult female. B.M. no. 1. 6. 7. 59. Original number 1363. Collected 16th February, 1901, by Perry O. Simons. Presented by Oldfield Thomas. Four specimens in all.

This remarkable little cavy furnishes a good example of the difficulty of distinguishing young specimens from old in this group; for, in spite of the fairly close survey of the collection always kept up, no one has previously noted that Mr. Pentland's specimen, received sixty-six years ago, is fully adult, and it is only on the general examination of the group now made that I have found this out, and am able to give Mr. Pentland the credit for a very interesting discovery. The first scientific explorer of the Titicaca plateau, he sent home quite a number of interesting specimens, but, of course, had not been instructed as to the proper preservation of data. On this account I have chosen one of Mr. Simons's three specimens as the type. These were erroneously called *C. aperea* in my account of the latter's Bolivian collection.

In proof that the specimens are full grown, I may note that the type has its basilar suture closed, while Mr. Pentland's specimen has already the tell-tale sagittal crest characteristic of old individuals.

Lastly, we have the Brazilian species with the deep notch on the outer side of  $m^3$  already referred to. There appears to be only one species of this group, whose name and characters are as follows:—

*Cavia fulgida*, Wagler.

*Cavia fulgida*, Wagler, Isis, xxiv. p. 512 (1831); Wagn., Schr. Säug., Supp. iv. p. 59 (1843) (redescription of type).

*Cavia rufescens*, Lund, K. Dansk. Vid. Selsk. viii. p. 282 (1841).

*Cavia nigricans* and "*Kerodon obscurus*, Licht.," Wagn., Schr. Säug., Supp. iv. p. 64 (1843).

Size comparatively small, greatest skull-length rarely attaining 60 mm. Colour rich dark grizzled brown; under surface deep buffy or ochraceous, dulled by the greyish bases of the hairs showing through to a variable extent.

Last upper molar with a deep indentation on its outer side at the anterior end of the posterior lobe.

Range from Lagoa Santa, Minas Geraes, to Santa Catharina; type said to have been obtained on the "Amazonian" journey of Spix\*, but the species is not known to occur on the Amazon.

\* Spix's other explorations were mostly in the region inhabited by the species I now call *C. fulgida*, and some error probably crept in as to the particular trip on which it was collected. Or, with the loose geography of the time, all his Brazilian journeyings may have been spoken of as "Amazonian." Wagner expressed certainty as to the identity of *fulgida* and *rufescens*, and there appears to me no doubt about it.

Specimens in Museum from Minas Geraes (Zool. Soc. Museum); Engenheiro Reeve, Espiritu Santo (*A. Robert*); Rio Janeiro (*Capt. Milner* and *L. Hardy du Dreneuf*); Cruzeiro and Piqueté, São Paulo (*Robert*); Moretes, Parana (*Robert*); Humboldt (*Ehrhardt*) and Joinville (*Behr*), Santa Catherina.

A very distinct species, readily recognizable by its peculiar *m*<sup>3</sup>. In colour it is not unlike *Cavia rosida*, but has not the special darkening on the back.

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## BIBLIOGRAPHICAL NOTICE.

### *African Freshwater Fishes.*

WITH the completion of vol. iv. of the 'Catalogue of Freshwater Fishes of Africa' (London, the Trustees of the British Museum, 1916) Mr. G. A. Boulenger has earned the gratitude, not merely of students of African fishes or of ichthyologists in general, but of all who are concerned with the problems of geographical distribution.

In these four volumes Mr. Boulenger has described the largest collection of freshwater fishes ever brought together from one area in any part of the world, comprising as it does over 15,000 specimens now in the British Museum and an almost equal number in the museums of the Nile Survey, the Congo (Tervueren), S. Africa, Paris, and Luxemburg.

How immensely our knowledge of the freshwater fishes of Africa has grown during the last thirty years or so may be gathered from the fact that in 1880 only 255 species were known. Ten years ago this number had increased to 974. In the present catalogue no less than 1425 species are described, and this increase is largely due to the zeal and enthusiasm of the author of this catalogue, of which he may well be proud.

Though it would materially have increased the bulk of these volumes, we venture to think that their value would have been immensely increased by the addition of internal anatomical characters—or, at any rate, of skeletal characters—and field-notes contributed by the collectors. But there were probably good reasons for reducing the work to the smallest possible dimensions. Happily it is well illustrated and has a good index.



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# THE ANNALS

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## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 110. FEBRUARY 1917.

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XII. — Coleoptera, Heteromera (*excluding* Tenebrionidæ) *from the Seychelles Islands and Aldabra* \*. By GEORGE CHARLES CHAMPION, F.Z.S.

[Plate VI.]

THE material reported upon in the present paper forms part of the collections made by the Percy Sladen Trust Expeditions of 1905 and 1908-9 in the Seychelles and other islands of the Western Indian Ocean \*. The twenty-six species of Heteromorous Coleoptera enumerated belong to eight families, the Monommidæ, Cistelidæ (= Alleculidæ), Melandryidæ, CEdemeridæ, Anthicidæ, Pedilidæ, Xylophilidæ, and Mordellidæ. The Tenebrionidæ (at present in the hands of Herr Hans Gebien) are not included. The collections examined illustrate the abundance of certain CEdemerids, Xylophilids, and Mordellids (*Mordellistena*) in the islands and the presence of two peculiar Melandryid genera in the Seychelles. A first set of the material, including the *types* of all new forms, will be placed in the British Museum.

\* Many results of this Expedition have been published in a special series of volumes of the Linnean Society's 'Transactions' (ser. 2, Zool. vols. xii.-xvii.).



*List of Species.*Fam. **Monommidae**.

- 1.
- Monomma pruinosum*
- , sp. n.

Fam. **Cistelidae** (= **ALLECULIDÆ**).

- 2.
- Cacoplesia viriditincta*
- , sp. n.
- 
3. "
- annulipes*
- , sp. n.

Fam. **Melandryidae**.

- 4.
- Stictodrya*
- (gen. nov.)
- longipennis*
- , sp. n.
- 
- 5.
- Mycteromimus*
- (gen. nov.)
- insularis*
- , sp. n.

Fam. **Ædemeridae**.

- 6.
- Oxaxis grisescens*
- , Fairm.
- 
7. "
- lineola*
- , Fairm.
- 
- 8.
- Ananca aldabrana*
- , sp. n.
- 
9. "
- scabripennis*
- , sp. n.
- 
10. "
- submarginata*
- , sp. n.

Fam. **Anthicidae**.

- 11.
- Anthicus oceanicus*
- , Laf.

Fam. **Pedilidae**.

- 12.
- Eurygenius fragilicornis*
- , sp. n.
- 
13. "
- convexicollis*
- , sp. n.

Fam. **Xylophilidae**.

- 14.
- Xylophilus torticornis*
- , sp. n.
- 
15. "
- clavicornis*
- , sp. n.
- 
16. "
- seychellarum*
- , sp. n.

Fam. **Mordellidae**.

17. \*
- Mordella braueri*
- , Kolbe.
- 
18. "
- peregrinator*
- , sp. n.
- 
19. "
- disparilis*
- , sp. n.
- 
- 20.
- Mordellistena mahena*
- , Kolbe.
- 
21. "
- degressa*
- , sp. n.
- 
22. "
- partilis*
- , sp. n.
- 
23. "
- coleæ*
- , sp. n.
- 
24. "
- septemcarinata*
- , sp. n.
- 
25. "
- dirempta*
- , sp. n.
- 
26. "
- argutula*
- , sp. n.

Fam. **Monommidae**.**MONOMMA.***Monomma*, Castelnau, Hist. Nat. Ins. ii. p. 215 (1840).1. *Monomma pruinosum*, sp. n.

Elliptic, rather broad, feebly shining, nigro-piceous or black, at most obsoletely rufo-variegate, the reddish coloration sometimes becoming more distinct along the lateral and apical margins of the prothorax, towards the sides of the elytra before the apex, and on the humeri beneath, the antennal club, the palpi, and the legs in part also rufescent; somewhat thickly clothed above with minute, fulvous, adpressed, squamiform hairs, which are condensed into a small patch on each elytron at the base. Head densely punctate. Prothorax rounded at the sides anteriorly, closely, finely punctate, the anterior angles arcuately produced, the hind angles subrectangular. Elytra transversely gibbous

\* Not represented in the collections made by the Expedition.

before the middle, with rows of somewhat closely placed, rather coarse, shallow punctures placed in fine shallow striæ, the punctures becoming coarser and less approximate and the striæ obsolete on the gibbous portion of the disc, the interstices minutely punctate throughout, moderately convex towards the sides and apex, and almost flat on the disc. Beneath closely, finely punctate, the punctures on the anterior and lateral portions of the metasternum coarse and scattered; prosternal process moderately broad, the marginal carinæ parallel; fifth ventral segment with a very deep, bisinuate, transverse sulcus extending across the middle from the outer margin, interrupted in the centre by a dentiform backward prolongation of the anterior portion of the segment.

Length  $5\frac{1}{5}$ – $6\frac{1}{5}$ , breadth  $3\frac{1}{5}$ – $3\frac{4}{5}$  mm.

*Loc.* Aldabra: Takamaka, x.–xi. 1908. (*Fryer*).

Eleven specimens, almost certainly including the two sexes. Near *M. irroratum*, Klug, from Madagascar, but smaller; the vestiture finer and more scattered, not condensed into two well-defined densely punctate spots on the disc of the prothorax (well shown in Klug's figure); the prothorax more finely punctate; the elytra less dilated at the sides below the humeri, the humeri more acute, the seriate punctures smaller and shallower, the dentiform backward prolongation of the basal portion of the fifth ventral segment narrower and extending to very near the apex.

### Fam. Cistelidæ (= Alleculidæ).

#### CACOPLESIA.

*Cacoplesia*, Fairmaire, Ann. Soc. Ent. Belg. xlii. p. 237 (1898).

The two species provisionally referred to this genus have the penultimate joint of the tarsi lobed and the tibial spurs small, as defined by Fairmaire.

#### 2. *Cacoplesia viriditincta*, sp. n. (Pl. VI. fig. 1, ♂.)

Oblong-oval, moderately elongate, subopaque, subglabrous, fusco-testaceous, more or less suffused with green or golden-green, the head and prothorax being almost entirely of this colour, the elytra more dilute, the antennæ and legs testaceous or obscure testaceous. Head closely, finely punctate, the epistoma separated from the front by a shallow groove; eyes large, prominent, slightly smaller in ♀, separated by less than the width of one of them as seen

from above; last joint of maxillary palpi rather narrow, elongate-triangular; antennæ slender, long in ♂, shorter in ♀, joints 3-11 subequal in length, 3-10 feebly subserrate. Prothorax transverse, rather small, arcuately narrowing from a little behind the middle to the apex, the base broadly subtruncate, the hind angles obtuse; the punctuation fine and sparser than on the head, the interspaces alutaceous. Elytra much wider than the prothorax, moderately elongate, subparallel in their basal half in ♂, a little widened posteriorly in ♀; deeply crenato-striate, the punctures closely placed, the interstices convex throughout and very sparsely, finely, irregularly punctate. Ædeagus of ♂ long, tapering, abruptly bent at some distance before the slender tip.

Length  $7\frac{1}{2}$ - $8\frac{1}{2}$ , breadth  $3$ - $3\frac{1}{2}$  mm. (♂ ♀.)

*Loc.* Aldabra: Esprit Island, xii. 1908 (*Fryer*).

Five specimens, the two males having the ædeagus protruding. Allied forms occur in Madagascar, and it is just possible that the present species may be referable to one of them. It has the upper surface obviously less shining than in *C. micans*, Klug, *cærulans* and *cæruleovirens*, Fairm., &c., to judge from the descriptions of those insects.

### 3. *Cacoplesia annulipes*, sp. n. (Pl. VI. fig. 2, ♂.)

Oblong-ovate, convex, the head and prothorax opaque, the rest of the surface shining; head, prothorax, and coxæ, and the basal joint of the antennæ in immature examples, obscure ferruginous, the rest of the antennæ black, the elytra brown, the legs testaceous, with the knees, and sometimes the apices of the tibiæ also, black; very finely pubescent, the elytra almost glabrous. Head small, densely, rugosely punctate, the epistoma confused with the front; eyes small, strongly transverse, rather prominent, somewhat distant from the base of the head; last joint of maxillary palpi small, subtriangular; antennæ extending to beyond the middle of the elytra, joint 2 small, 3 and 5 equal, 4 slightly longer, 5-10 gradually becoming shorter and stouter, 11 ovate, shorter than 10. Prothorax transversely convex, short, nearly twice as wide as the head, rounded at the sides, a little more narrowed in front than behind, subtruncate at the base, the hind angles obtuse; densely, rugulosely punctate. Elytra convex, moderately long, about one-half wider than the prothorax, narrowing from the middle, the humeri rounded; crenato-striate, the punctures closely placed, the interstices convex, faintly punctulate. Beneath closely,



finely punctate. Fifth ventral segment with a shallow transverse depression before the apex.

Length  $3\frac{1}{2}$ –4, breadth  $1\frac{1}{2}$ – $1\frac{2}{3}$  mm. (♂.)

*Loc.* Seychelles: Mahé.

Four specimens, apparently all males, from the damp endemic mountain-forests above Cascade Estate and in the Mare aux Cochons district (between 1000 and 2000 feet). This species has the legs coloured as in *Plesia geniculata*, Klug, from Madagascar. It will doubtless have to be removed from *Cacoplesia*, on account of the small head and eyes, the small apical joint of the antennæ, the convex general shape, &c. It can hardly be referred to *Allecula*, a genus at present including many heterogeneous forms. Allied insects inhabit Borneo.

### Fam. Melandryidæ.

#### STICTODRYA, gen. nov.

Head short, small, obliquely narrowed immediately before the very large prominent eyes and parallel-sided behind them, the epistoma not separated from the front; labrum strongly transverse; mandibles small; maxillary palpi rather stout, the apical joint triangular; antennæ very short, slender, subserrate towards the tip; prothorax transverse, without trace of marginal carina, the base feebly bisinuate, with distinct foveæ; scutellum small; elytra elongate, much wider than the prothorax, subparallel, without trace of striæ, the punctuation uniform, the epipleura not reaching the apex; anterior coxæ contiguous, the cavities open behind; intermediate coxæ well separated; intercoxal process of abdomen narrow, triangular; ventral segments rather long, the sutures almost straight; tibial spurs minute; tarsi with penultimate joint and the one preceding it lobed beneath, the former broad, the claws feebly developed and appendiculate; body elongate, depressed, the integument rather soft, variegated with lighter and darker pubescence.

Type, *S. longipennis*.

This genus seems to be best placed near *Thisias* and various other forms provisionally referred by me to Melandryidæ.

The structure of the mandibles cannot be seen in the unique example obtained. The narrow, immarginate, basally foveate prothorax, elongate, subparallel, uniformly punctate,

fasciate elytra, smaller eyes, &c., separate *Stictodrya* from *Mycteromimus*. Fairmaire's Melandryid-genus *Diegoa*, from Madagascar, is compared with *Marolia*, and it cannot, therefore, be very nearly allied to the Seychelles insect.

4. *Stictodrya longipennis*, sp. n. (Pl. VI. fig. 3, ♂.)

♂. Moderately shining, piceous, with a faint æneous lustre, the antennæ and legs testaceous; variegated above with very fine, adpressed brownish and flavo-cinereous pubescence, the latter condensed into dense patches on the prothorax and elytra, forming irregular interrupted fasciæ on the latter; the head, prothorax, and scutellum densely, finely punctate, the puncturing of the elytra a little more diffuse. Head convex, transversely depressed in front, the post-ocular portion about one-third the length of the eye; antennæ reaching the base of the prothorax, very slender, joints 3-10 gradually decreasing in length, 2 short, stout, 3 about twice as long as 2, 9 and 10 triangular, 11 short-ovate. Prothorax transverse, a little wider than the head with the eyes, the sides rounded anteriorly and parallel behind, the disc obliquely depressed on each side, the small basal foveæ polished. Elytra about four times the length of the prothorax, the humeri somewhat oblique in front. Ventral segments 1-5 closely, finely punctate, simple.

Length  $5\frac{3}{4}$ , breadth 2 mm.

*Loc.* Seychelles: Mahé.

One specimen, beaten from dense forest-vegetation of "Capucin"-trees (*Northea*), *Roscheria*-palms, &c., on the summit of Morne Pilot, over 2000 feet, xi. 1908.

*MYCTEROMIMUS*, gen. nov.

Head short, obliquely narrowed before the eyes, the epistoma not separated from the front; eyes very large, reaching the anterior margin of the prothorax; labrum strongly transverse; antennæ short, slender, the outer joints subserrate, 11 short-ovate, simple; mentum strongly transverse; apical joint of maxillary palpi stout, elongate-triangular; mandibles acute at tip, toothed towards the apex beneath; prothorax short, closely applied to the elytra, bisinuate at the base, distinctly margined to near the apex at the sides beneath; scutellum small; elytra much wider than the prothorax, oblong, without trace of striæ, the sculpture consisting of intermixed minute and larger punctures, the epipleura not reaching the apex; anterior coxæ

small, contiguous, the cavities open behind and closed by the mesosternum; intermediate coxæ narrowly separated; intercoxal process of the abdomen rather narrow, triangular; ventral segment 5 simple in both sexes, 2 with a pubescent tubercle in ♂; tibial spurs minute; tarsi sparsely pubescent on their lower surface, penultimate joint broad and lobed beneath, the claws appendiculate; body oblong-oval, densely pubescent.

Type, *M. insularis*.

The single species from which the above characters are taken is nearly related to the holarctic genus *Mycterus*, some of the members of which have a non-rostrate head; but it differs from these latter in the still shorter head, the greatly developed eyes, the elongate-triangular apical joint of the maxillary palpi, the small scutellum, &c. An unnamed insect from Madagascar (represented by two broken examples in the British Museum) is still more closely allied to the Seychelles insect.

5. *Mycteromimus insularis*, sp. n. (Pl. VI. fig. 4, ♀.)

Moderately convex, shining, æneo-piceous, the legs, mouthparts, and antennæ (except the intermediate joints in mature examples) testaceous; densely clothed with pale brownish or brownish cinereous pubescence (which almost hides the sculpture), that on the prothorax transversely arranged; the entire surface densely, minutely punctate, with scattered, irregularly placed, slightly coarser punctures intermixed, these latter giving an asperate appearance to the elytra when the vestiture is removed. Antennæ with joint 3 about twice as long as 2, 3-10 gradually becoming shorter and subserrate, 9 and 10 subtriangular, 11 short-ovate. Prothorax strongly transverse, the sides rounded anteriorly and parallel at the base. Elytra about four times the length of the prothorax, the humeri rounded.

♂. Ventral segment 2 somewhat gibbous in the middle anteriorly and at this place bearing a small, fulvo-pubescent tubercle.

Length  $4-6\frac{1}{2}$ , breadth  $2-2\frac{1}{2}$  mm. (♂ ♀.)

Loc. Seychelles: Silhouette, Mahé.

Twelve specimens, only obtained by beating from the growing leaves of one species of endemic palm (*Stevensonia sechellarum*) in the mountain-forests: Silhouette, above Mare aux Cochons, over 1000 feet, ix. 1908; Mahé, near Morne Blanc, and above Cascade Estate, in both cases at about 1000 feet. The insect is probably pulverulent in life

like its Palæarctic allies. The European *Mycterus curculionoides* F., has a similar tuft of hairs on the second ventral segment in the male.

### Fam. *Ædemeridæ*.

One species of this family is quoted by Kolbe as having been recorded from the Seychelles by Fairmaire in 1893, but no name was given; the insect in question is doubtless one of those subsequently described by the French author\*.

### *Oxaxis*.

*Oxaxis*, Leconte, New Species Coleopt. p. 165 (1866); Leconte & Horn, Class. Coleopt. N. Am. p. 405 (1883); Champion, Biol. Centr.-Am., Coleopt. iv. 2, p. 149, and Trans. Ent. Soc. Lond. 1896, p. 39.

The insects placed under this genus have the mandibles uneleft at the apex, the right one, at most, with a short tooth before the tip. Amongst the ten species of *Ananca* recorded by Fairmaire from Madagascar or the Seychelles two, at least, *A. grisescens* and *A. lineola*, belong to *Oxaxis* as here understood, and *Lagriæ livida*, F. (selected by Semenow as the type of *Sessinia*, Pasc.), from Tahiti, is congeneric with it. Fairmaire notes the extreme rarity of the males of some of these *Ædemerids*.

#### 6. *Oxaxis grisescens*. (Text-fig. 1, ♂ genital armature.)

*Ananca grisescens*, Fairm. Ann. Soc. Ent. Belg. xli. p. 119 (1897).

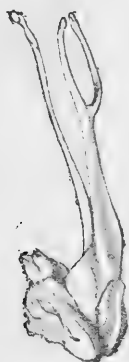
Elongate, robust, pale testaceous, the eyes and the tips of the mandibles black, subopaque, the anterior portion of the head shining, thickly clothed with very fine pallid pubescence. Head above and between the eyes densely, finely punctate, the punctuation becoming coarser and diffuse on the anterior half, the epistoma rather long; eyes very large; left mandible simple, right mandible toothed before the tip; antennæ nearly as long as the body in ♂, a little shorter in ♀, joint 3 distinctly longer than 4, 11 shorter than 10 and feebly constricted at the middle. Prothorax oblong-subcordate, densely, finely punctate, obsoletely, interruptedly canaliculate down the middle, the shallow groove terminating in a deeper, transverse, foveiform depression before the base, the disc transversely flattened or depressed towards the apex,

\* Fairmaire also mentions (Bull. Soc. Ent. Fr. 1893, p. xcix) a Cantharid and a Rhizophorid from the Seychelles, but no names are given.

without definite foveæ. Elytra elongate, subparallel in their basal half, closely, extremely finely punctate, obsoletely bicostate on the disc from the base to beyond the middle.

♂. Sixth (hidden) ventral segment divided into two long, inwardly curved, sinuous, concave, forcipiform lobes, the small seventh segment very deeply emarginate, a long, slender, pilose rod extruding from the emargination; ædeagus extremely elongate, slender, thickened at the tip, lateral lobes long, ciliate, arising from a common stem, which is abruptly bifurcate from a little beyond the middle. (Text-fig. 1.)

Fig. 1.



*Oxacis (Ananca) grisescens*, Fairmaire, ♂. Gen. armature.

Length 10–12 mm. (♂ ♀.)

*Loc.* Seychelles: Mahé, Silhouette, Praslin, Félicité, Bird Island (1905 and 1908–9); Round Island (Mus. Brit.). The specimens were all found at or near the coast, never in the endemic forests of the mountains.

Fifteen examples seen, including a ♂ from Round Island, received by the British Museum in 1870. The very fine close puncturing of the upper surface, the long third antennal joint, the form of the mandibles, and the generally robust body, distinguish *O. grisescens* from the allied insects occurring in the Seychelles, whence Fairmaire's type was obtained. It is the only one to which his brief description applies.

#### 7. *Oxacis lineola*.

*Ananca lineola*, Fairm. Ann. Soc. Ent. Belg. xxxix. p. 453 (1895).

Elongate, shining, finely pubescent; pale testaceous, the

eyes and the tips of the mandibles black, the prothorax with a narrow median vitta and an oblong spot on each side (the vitta sometimes interrupted and the spot wanting), and the head in some specimens with a spot between the eyes, fuscous, the elytra fuscous, with the suture, three narrow lines on the disc (the outer one fainter and abbreviated anteriorly), and the lateral margin more broadly, pale testaceous, the ventral surface and metasternum in part infuscate. Head moderately produced anteriorly, very finely punctate; eyes large, separated by more than the width of one of them as seen from above; mandibles uncleft at the tip; antennæ long, joint 3 longer than 4, 4-10 decreasing in length, 11 longer than 10 and feebly constricted at the middle. Prothorax longer than broad, moderately constricted behind the middle, transversely depressed anteriorly and also hollowed in the centre before the base; the surface polished, very finely punctate, with an indication of a smooth median line. Elytra much wider than the prothorax, somewhat attenuate posteriorly, closely, very finely punctate, without definite costæ.

♂. Fifth ventral segment excavate down the middle before the apex.

Length 7-10½ mm. (♂ ♀.)

Loc. Aldabra (1908, *Fryer*). Madagascar (Mus. Brit.).

Four specimens, one only of which (a ♀) is from Aldabra, apparently referable to *A. lineola*, Fairm., the type of which was from Madagascar.

#### ANANCA.

*Sessinia*, Pascoe, Journ. Ent. ii. pp. 45, 488 (1863) (nomen nudum).

*Ananca*, Fairmaire et Germain, Ann. Soc. Ent. Fr. 1863, p. 267.

*Copidita*, Leconte, New Species Coleopt. p. 164 (1866); Champion, Biol. Centr.-Am., Coleopt. iv. 2, p. 144, and Trans. Ent. Soc. Lond. 1896, p. 40.

This genus differs from *Oxacis* in having both mandibles cleft at the tip. No type was given by Pascoe for *Sessinia* and his name cannot be accepted. The five species referred to *Ananca* by Fairmaire and Germain were all from Chile; the first of these, *Nacerdes pallens*, Sol., which must be taken as the type, proves to have bifid mandibles, and the name *Ananca*, therefore, must be adopted in place of *Copidita*, used by me elsewhere.

#### 8. *Ananca aldabrana*, sp. n.

Elongate, luteo- or fulvo-testaceous, the eyes and the tips

of the mandibles black, subopaque, the head shining, thickly clothed with rather coarse pallid pubescence. Head moderately produced in front, the epistoma rather long, coarsely, closely punctate; eyes large; mandibles each bifid at the tip; antennæ not reaching the apex of the elytra, joints 3 and 4 subequal in length, 11 feebly constricted at the middle. Prothorax considerably longer than broad, subcordate, narrow, densely, coarsely, subconfluently punctate, broadly depressed and subfoveate on each side of the disc anteriorly. Elytra long, nearly twice as wide as the prothorax, somewhat convex, closely, finely, scabroso-punctate, each with two distinct costæ on the disc and another near the outer margin, all three extending from the base to near the apex.

♂. Sixth (hidden) ventral segment divided into two narrow, curved, concave, forcipiform lobes, the corresponding dorsal segment similarly shaped; ædeagus long, rather stout, gradually widened towards the tip, the latter rounded, lateral lobes very long, slender, and feebly curved.

Leng h 8-12 mm. (♂ ♀).

Loc. Aldabra (1908-9, *Fryer*). Seychelles: Round Island (Mus. Brit.).

Found in abundance at Aldabra, in several parts of the atoll. In the British Museum there are also two females and a male of the same species from Round Island. Very few males are contained in the long series before me; three, however (including the one from Round I.) have been identified, and their genital armature examined. The bifid mandibles, the densely, rather coarsely punctured, dull, subbifoveate, narrow prothorax, and the finely punctate, more distinctly costate elytra, readily separate *A. aldabrana* from *Oxaxis* (*Ananca*) *grisescens*, Fairm. *A.* (*Sessinia*) *andrewsi*, Arrow, from Christmas Island, under which two species were confused by the author, has the terminal joint of the antennæ almost divided into two, the head much smoother, the prothorax non-foveate, and the elytra sharply bicostate on the disc, with the rest of their surface very finely, closely punctate.

#### 9. *Ananca scabripennis*, sp. n.

(Text-fig. 2, ♂ genital armature.)

*Sessinia andrewsi*, Arrow, Monogr. Christmas Isl. p. 107 (1900) (♀, nec ♂).

Elongate, testaceous or obscure testaceous, the eyes and the tips of the mandibles black, subopaque, the head and prothorax shining, finely pubescent. Head moderately

produced in front, sparsely, rather coarsely punctate, the punctures becoming more crowded towards the base; eyes large, separated by about the width of one of them as seen from above; mandibles each bifid at the tip; antennæ nearly as long as the body in ♂, shorter in ♀, joints 3-10 decreasing very slightly in length, 11 slightly longer than 10 and feebly constricted at the middle. Prothorax longer than broad, narrow, subcordate, rather sparsely, moderately coarsely punctate, the disc excavate on each side of the middle anteriorly and also in the centre before the base, appearing trifoveate. Elytra long, closely and rather coarsely scabrosopunctate, each with two faint costæ on the disc and another near the outer margin.

♂. Sixth (hidden) ventral segment divided into two, curved, concave, comparatively short lobes; ædeagus moderately long, gradually narrowed at the apex, the long narrow tegmen divided into two slender, acuminate processes (lateral lobes) from about the middle. (Text-fig. 2.)

Fig. 2.



*Ananca scabripennis*, Champion, ♂. Gen. armature.

Length 8-10 mm. (♂ ♀.)

*Loc.* Seychelles: Mahé, Silhouette, Praslin (1905, 1908-9). Christmas Island (Mus. Brit.). The examples from the Seychelles were all taken near the coast, not in the endemic mountain-forests.

Twelve specimens, apparently all females but one. Various female examples from Christmas Island placed by Arrow under his *Sessinia andrewsi* doubtless belong to this species. They differ from his type (♀, not ♂ as stated) in having the



elytra roughly sculptured and obsoletely costate, the prothorax subtrifoveate, the apical joint of the antennæ feebly constricted, &c.

10. *Ananca submarginata*, sp. n.

♂. Moderately elongate, narrow, depressed, shining, finely pubescent; pale testaceous, the tips of the mandibles, the eyes, an oblong spot on each side of the prothorax, and an evanescent submarginal stripe on each elytron (extending from the humeral callus to beyond the middle), black or piceous; the entire upper surface closely, very finely punctate. Head slightly produced anteriorly; mandibles each bifid at the tip; eyes large, separated by considerably more than the width of one of them as seen from above; antennæ slender, extending to a little beyond the middle of the elytra, joints 3-5 subequal, 6-11 distinctly shorter, 11 feebly constricted. Prothorax longer than broad, subcordate, slightly hollowed on each side of the disc anteriorly and also in the middle towards the base. Elytra comparatively broad, moderately elongate, subparallel, faintly bicostate on the disc for about three-fourths of their length, the punctuation a little finer and more diffuse than that on the prothorax.

Ædeagus (as seen completely everted) long, bisagittate at the apex, the outer portion of the sheath also sagittate and divided at the tip into two slender acute processes; lateral lobes widely separated from the base, extremely elongate, slender, and ciliate.

Length 7 mm.

Loc. Aldabra: Takamaka, xi. 1908 (*Fryer*).

One male. A rather slender form, with a spot on each side of the prothorax and a submarginal streak on each elytron infusate, the eyes widely separated, the upper surface shining and finely punctate, the mandibles bifid at the tip.

Fam. Anthicidæ.

ANTHICUS.

*Anthicus*, Paykull, Fauna Suecica, i. p. 253 (1798).

A cosmopolitan genus represented in all parts of the world.

11. *Anthicus oceanicus*.

*Anthicus oceanicus*, Laferté, Monogr. Anthic. p. 170; Fairm., Rev. et Mag. Zool. 1849, p. 452; Pic, Ann. Soc. Ent. France, 1894, p. 668; Alluaud, Hist. Madag., Coleopt. p. 487; Kolbe, Mitteil. Zool. Mus. Berlin, v. p. 27.

*Loc.* Seychelles: Bird Island, vii. 1908 (*Fryer*). Marquesas; Tahiti; Polynesia.

Three specimens are before me from Bird Island; this is one of two small coral-islands situated on the north of the Seychelles Bank, but which have neither the peculiar flora nor any of the physical features characteristic of the other islands of the group. Recorded by Pic as having been found in numbers by M. Ch. Alluaud in the Seychelles in April, 1892, beneath seaweed on the coast.

Fam. *Pedilidæ*.

*Eurygenius*, Laferté, Monogr. Anthic. p. 1 (1846).

The known species of this genus are mostly from North or Central America; two from Madagascar, however, have been described by Fairmaire, one from Japan by Lewis, one from E. Africa and another from Bengal by Pic, one from the Nilgiri Hills by myself, and one from E. Africa by Kolbe.

12. *Eurygenius fragilicornis*, sp. n. (Pl. VI. fig. 5, ♀.)

Elongate, narrow, somewhat shining, æneo-piceous or piceous, the anterior portion of the head rufous, the basal joint of the antennæ, the mouth-parts (the tips of the mandibles excepted), the humeri, femora, and the tibiæ in part or entirely, testaceous; somewhat thickly clothed, the legs and antennæ included, with rather long, semierect, pallid pubescence. Head densely, rugulosely punctate, obliquely narrowed behind the eyes, the latter extremely large, rounded, very feebly emarginate in front, coarsely faceted; mandibles entire; maxillary palpi with terminal joint stout, securiform, the two preceding joints angulate within; antennæ about half the length of the body, a little shorter in ♀, very slender, joints 3-10 elongate-obconic, subequal in length, 2 shorter than 3, 11 slightly longer than 10 and constricted beyond the middle. Prothorax narrower than the head (with the eyes), transversely orbicular, the narrow neck-like anterior portion rather long, the entire surface densely, rugulosely punctate. Elytra elongate, much wider

than the prothorax, parallel in ♀, broader at base and somewhat attenuate in ♂; closely set with subseriately arranged, coarse, oblong, foveiform punctures, the narrow interspaces minutely punctate and here and there transversely confluent.

♂. Femora stouter than in ♀, the hind tibiæ more curved; fifth ventral segment unimpressed, simply truncate at tip.

Length 6, breadth  $1\frac{1}{2}$  mm. (♂ ♀.)

Loc. Seychelles: Mahé.

One pair, taken (4. ii. 1909) on the precipitous slopes of the peak of Morne Seychellois at an elevation of about 2000 feet; the specimens were obtained by sweeping a dense low growth of native ferns and shrubs (*Melastoma*, *Rubus*, *Senecio sechellensis*, &c.), among which were occasional *Roscheria*-palms and other small trees. The coarsely and closely foveato-punctate elytra separates the present species from the Madagascar forms. The single representative from the adjacent island of Silhouette cannot be treated as a variety of it.

### 13. *Eurygenius convexicollis*, sp. n.

♂. Elongate, rather narrow, opaque, the elytra and under surface somewhat shining; nigro-piceous, the epistoma and scutellar region rufescent, the two basal joints of the antennæ, the mouth-parts (the tips of the mandibles excepted), femora, and tarsi in part, testaceous; somewhat thickly clothed, the antennæ and legs included, with rather long, pallid, coarse, semierect pubescence. Head, palpi, and eyes as in *E. fragilicornis*, the antennæ a little shorter and stouter, about as long as in ♀ of that species. Prothorax distinctly broader than the head (with the eyes), much narrowed behind. Elytra broader than in *E. fragilicornis*, narrowing from the base, the narrow interspaces between the subseriately arranged foveiform punctures more rugose, giving a dull appearance to the surface. Legs stout, the posterior tibiæ feebly curved. Fifth ventral segment broadly hollowed down the middle, truncate at the apex.

Length 6, breadth  $1\frac{3}{5}$  mm.

Loc. Seychelles: Silhouette, viii. 1908.

One male example.

### Fam. Xylophilidæ.

#### XYLOPHILUS.

*Xylophilus*, Latreille, Fam. Nat. Règne Anim. p. 383 (1825).

A genus almost cosmopolitan in its distribution. Three

species are represented in the Seychelles collection, all of them apparently being fairly common insects in the Islands. Mr. Scott notes that "many of them were swept from grass and other low-growing vegetation." So far as known, they are wood-feeders in their earlier stages. Owing to their extreme fragility, very few of the specimens obtained are in good condition. Upwards of a dozen species have been described from Madagascar, three from Mauritius, one from Bourbon, &c.

14. *Xylophilus torticornis*, sp. n.  
(Pl. VI. figs. 6 ♂, 7 ♂ antenna.)

Rather short, moderately shining, very finely cinereo-pubescent, black, the tips of the tarsi, and sometimes that of the eleventh antennal joint also, reddish. Head short, together with the eyes broader than the prothorax, finely punctate; eyes moderately large, occupying nearly the whole of the sides of the head, feebly emarginate, distant; antennæ (fig. 9) moderately long, closely setose, somewhat twisted, stout, joints 2 and 3 short, 4-10 broad, perfoliate, very strongly transverse, 6-8 wider than the rest, 11 stout, ovate, about as long as 9 and 10 united. Prothorax transverse, convex, rounded at the sides, closely, rather finely punctate, bi-impressed on the disc posteriorly. Elytra much wider than the prothorax, subparallel in their basal half, closely, rather coarsely punctate, obliquely depressed on the disc below the base. Legs short; posterior femora moderately thickened, obsoletely sulcate beneath; basal joint of posterior tarsi slightly curved.

Var. *a*. Duller, the punctuation denser and coarser.

Var. *β*. Shining, the punctuation more scattered than in the type.

Length 1-1½ mm. (♂ ♀.)

*Loc.* Seychelles: Silhouette [type]; Mahé [var. *a*]; Praslin [var. *β*].

Eighteen specimens—twelve of the form from Silhouette selected as type, two of the var. *a* from Mahé, and four of the var. *β* from Praslin, three of these much smaller than the rest. The examples from Silhouette were found in the forest near the Mare aux Cochons plateau, ix. 1908; the two from Mahé are from high elevations in the forests of Morne Blanc and the Mare aux Cochons district; those from Praslin were collected on Côtes d'Or Estate, xi. 1908. The females appear to have the antennæ a little less widened and the eyes rather smaller than in the males. A species

recognizable by the somewhat twisted antennæ, due to the joints 6-8 being more dilated than those preceding or following.

15. *Xylophilus clavicornis*, sp. n.  
(Pl. VI. fig. 9, ♀.)

Rather short, feebly shining, piceous or nigro-piceous, the tarsi, the bases of the tibiæ, and the antennal joints 2-9 and the tip of 11 testaceous; the prothorax and elytra in fresh specimens variegated with sharply defined, irregular patches of very fine grey pubescence (tending to form an interrupted median and subapical fascia on the elytra), the rest of the vestiture brown. Head short, together with the eyes broader than the prothorax, densely, finely punctate; eyes large, occupying nearly the whole of the sides of the head, distant, almost entire; antennæ rather short, sparsely setose, joints 2-8 each longer than broad, 2 nearly as stout as 1, 3 more slender, 4-8 scarcely stouter, 9-11 wider than those preceding, 9 transversely subtriangular, 10 broader, strongly transverse, 11 stout, acuminate-ovate, about as long as 9 and 10 united. Prothorax transverse, convex, somewhat rounded at the sides, densely punctate, and with an interrupted arcuate depression on the disc before the base. Elytra much wider than the prothorax, slightly rounded at the sides, densely, rather coarsely punctate, feebly depressed on the disc below the base. Legs short; posterior femora moderately thickened, obsoletely sulcate beneath; basal joint of posterior tarsi feebly curved.

Length 1-1½ mm. (♂ ♀.)

*Loc.* Seychelles: Silhouette, Mahé, Praslin.

Found in profusion in Silhouette and Mahé, sparingly on Praslin. Most, if not all, of the specimens are from the mountain-forests, from a number of different places and elevations: one was taken from a rotten and fungus-grown fallen trunk of the endemic "Bois Rouge" (*Wormia ferruginea*). Many of these examples are now in bad condition, very few having the cinereous markings intact. Recognizable by the slender, nigro-clavate antennæ, with stout second joint, the variegate legs, and the densely punctured, cinereo-maculate surface. The antennæ seem to be a little shorter in the females. The variegate vestiture of the elytra is common to many species of the genus. The beautiful example figured was accidentally injured by the artist after the drawing was completed and finally corrected.

16. *Xylophilus seychellarum*, sp. n. (Pl. VI. fig. 8, ♂.)

Rather short, moderately shining, nigro-piceous or piceous, the base and tip of the antennæ, the palpi, the base of the prothorax in the middle in some examples, the humeri or base of the elytra, and the legs testaceous, clothed with a fine sericeous pubescence. Head short, together with the eyes much wider than the prothorax, finely punctate; eyes large, occupying almost the whole of the sides of the head, separated anteriorly by about half the width of one of them in ♂, more distant in ♀, feebly emarginate; antennæ (♂) finely pubescent, long, slender, joint 2 short, 3-10 moderately elongate, becoming gradually shorter and wider, 9 and 10 subtriangular, 11 stouter, obliquely acuminate, nearly as long as 9 and 10 united, (♀) similar, but much shorter. Prothorax convex, broader than long, parallel-sided at the base, closely, finely punctate, with an interrupted arcuate depression on the disc behind. Elytra convex, rather short, at the middle about twice as wide as the prothorax, slightly rounded at the sides; closely, moderately coarsely punctate, obliquely depressed on the disc below the base. Legs rather long, slender; posterior femora moderately incrassate, simple in both sexes; basal joint of posterior tarsi feebly curved.

Length  $1\frac{1}{4}$ - $1\frac{1}{2}$  mm. (♂ ♀.)

*Loc.* Seychelles: Silhouette, Mahé.

Most of the examples were collected in the forests, but in Silhouette at least one was taken in the low country. Eighteen specimens, varying a little in colour, immature examples having the elytra paler. In this species the antennæ are moderately elongate in ♂, shorter in ♀, slender and very gradually widened outwards to the stouter apical joint in both sexes. The type of coloration is common to many members of the genus, some of which have peculiarly formed posterior femora in ♂.

## Fam. Mordellidæ.

## MORDELLA.

*Mordella*, Linnæus, Syst. Nat. 10th ed. i. p. 420 (1758).

17. *Mordella braueri*.

*Mordella braueri*, Kolbe, Mitteil. Zool. Mus. Berlin, v. p. 27.

*Loc.* Seychelles: Mahé (*Brauer*).

This insect is described as deep black and albo-maculate;

the prothorax with six spots—two, semilunate, on the anterior portion and four, confluent, near the base; the elytra with four spots—one sub-basal, median, one submarginal, posthumeral, one subsutural, a little before the middle, and one anteapical. 'It is compared with the Asiatic *M. composita*, Walk., and the African *M. elegans*, Mäkl.

The unique example known measures 14 mm. in length.

18. *Mordella peregrinator*, sp. n.

(Pl. VI. fig. 10, ♀.)

Robust, elongate, cuneiform, deep black, the anterior coxæ, the anterior femora in part, and the palpi testaceous, the antennæ often fuscous, with the base testaceous; clothed with black and whitish or cinereous pubescence, which is condensed into the following sharply defined markings:—The head with a large patch on the middle of the vertex, and the prothorax with an interrupted median vitta and a large triangular mark on each side of it, infuscate or black, for the rest whitish, cinereous, or flavo-cinereous; the elytra with three strongly angulate narrow fasciæ—one sub-basal, irregularly branching forwards (enclosing an oblique oval spot on the disc, an oblique humeral streak, a common postscutellar patch, and sometimes a small spot on each side of it), and one a little before and another just beyond the middle, these two connected along the suture—and a broader, simply arcuate, transverse fascia just before the apex, whitish or cinereous, for the rest black; the ventral segments at the base or laterally, the side-pieces of the metasternum, and the pygidium in great part above, also white. Antennæ slender, moderately long in ♂, shorter in ♀, joint 2 shorter and stouter than 3, 3–11 nearly equal in length, 5–10 serrate; last joint of maxillary palpi greatly developed, very broadly securiform, nearly as wide as the inter-antennal portion of the head in both sexes. Prothorax broader than the head and elytra, deeply bisinuate at the base, rounded at the sides. Elytra long, narrowing from the base. Pygidium very long, compressed, acute at tip. Ventral segment 5 hollowed down the middle posteriorly in ♂. Anterior femora and tibiæ simply pubescent in both sexes.

Length (excl. head)  $6\frac{1}{4}$ – $8\frac{1}{2}$ , to tip of pygidium  $8\frac{1}{2}$ – $11\frac{1}{2}$ ; breadth (prothorax)  $2\frac{1}{2}$ – $3\frac{1}{4}$  mm. (♂ ♀.)

*Loc.* Seychelles: Silhouette; Round I. Java; Borneo; Singapore; Philippines; Malacca; Ceylon, &c.

One ♀ specimen from Silhouette (Mare aux Cochons, ix. 1908). This is apparently a common species in Borneo,

Ceylon, &c., but it cannot be identified from any of the published descriptions. There is a long series of it in the British Museum from many different localities; and Mr. Bryant has recently captured numerous examples in Borneo. *M. mixta*, F., from New Guinea &c., is an allied form, and an unnamed insect from the Andaman Is. in the Museum collection is, perhaps, a variety of the present species. *M. composita*, Walk., has very different elytral markings.

19. *Mordella disparilis*, sp. n.

♂. Moderately elongate, rather narrow; black, the head (except a large transverse patch on the vertex, which is sometimes wanting), mouth-parts, joints 1-3 of the antennæ, the sides of the prothorax broadly, the elytra each with an oblique stripe extending from the shoulder to near the suture and a curved or oblique fascia just beyond extending narrowly backwards along the suture to near the tip (the latter sometimes nearly or quite obsolete, or represented by yellowish pubescence), the anterior coxæ, femora, and tibiæ, the intermediate tibiæ, the extreme base of the posterior tibiæ, and the calcaria testaceous or rufo-testaceous; variegated with cinereous, flavo-cinereous, and fuscous pubescence, the flavo-cinereous hairs mostly placed on the fasciate portions of the surface, the vestiture of the under surface almost wholly cinereous. Antennæ moderately long, slender, joints 2 and 3 very short, equal in length, 4-11 much longer than broad, suberrate. Terminal joint of maxillary palpi rather stout, subtriangular. Prothorax transverse, a little broader than the elytra, rounded at the sides. Elytra narrowing from the base. Pygidium about as long as the posterior tarsi. Anterior femora beneath, and anterior tibiæ at the base within, fusco-ciliate.

♀: Similar to ♂, but with the head, prothorax, and intermediate femora infuscate, the antennæ a little shorter, the anterior femora and tibiæ without longer hairs.

*Var.* The oblique elytral fasciæ connected along the middle of the disc.

Length (incl. pygid.)  $3\frac{2}{5}$ - $4\frac{1}{5}$  mm. (♂ ♀.)

*Loc.* Seychelles: Silhouette, Mahé.

Eleven examples; the six from Silhouette were taken in the high forest above Mare aux Cochons and in the low coconut-planted country near the coast at Pointe Étienne, ix. 1903; the five from Mahé were collected in the forest at the summit of Morne Pilot, over 2000 feet, in the Mare aux



Cochons district at about 1500 feet, and in the forest above Cascade Estate.

The eleven specimens vary in the development of the oblique testaceous elytral fasciæ, the posterior one being sometimes obsolete and in one example (♀) united to the anterior one. The dissimilarly coloured sexes were obtained in each island. *M. biformis*, from Central America, and the European *Mordellistena abdominalis* are parallel cases of sexual dimorphism. *M. disparilis* (♀) seems to be related to *M. homochroa*, Fairm., from Diego Suarez, but without comparison of types it would be unsafe to identify it with that insect. The variety with confluent fasciæ was found in a burrow in a stick in the jungle at Silhouette.

# MORDELLISTENA.

*Mordellistena*, Costa, Faun. Regn. Napol., Mordellid. pp. 16, 31 (1854).

A genus of world-wide distribution and abundantly represented within the tropics. One species from the Seychelles has been described by Kolbe and three from Madagascar by Fairmaire. *Mordella castanea*, Boh., from Guam, and various others from the adjacent regions referred to *Mordella* by the older authors may belong here. Mr. Scott's collections include about two hundred specimens, belonging to seven species. One of these insects was bred from larvæ found in the wood of *Colea pedunculata*. The appended table will help in the identification of these closely allied forms. The sexes have been identified in nearly every case by an examination of the genitalia of one or more examples of each species. The antennal structure is completely ignored by nearly all authors, presumably owing to difficulties of manipulation :—

Tibial and tarsal formula—4 or 5, 3 or 4, 2, 2; body uniformly coloured.	
Fourth antennal joint as long as fifth . . . . .	<i>mahena</i> , Kolbe.
Fourth antennal joint much shorter than fifth.	<i>degressa</i> , sp. n.
Tibial and tarsal formula—4, 3, 2, 1; head in ♂ ♀, and prothorax also in ♂, testaceous or rufo-testaceous; elytra cinereo-bifasciate . .	<i>partilis</i> , sp. n.
Tibial and tarsal formula—3, 3, 2, 0; fourth an- tennal joint short; body uniformly coloured, fusco-castaneous, robust . . . . .	<i>coleæ</i> , sp. n.
Tibial and tarsal formula—3, 2, 2, 0; fourth an- tennal joint short.	
Body uniformly coloured, fusco-castaneous, ferruginous, or testaceous above.	
Antennal joints 5-11 elongate . . . . .	<i>septemcarinata</i> , sp. n.

Antennal joints 5-11 not much longer than broad .....	<i>dirempta</i> , sp. n.
Body black, griseo-pubescent; head partly testaceous in ♂ .....	<i>argutula</i> , sp. n.

20. *Mordellistena mahena*.

(Text-fig. 3, posterior leg.)

*Mordellistena mahena*, Kolbe, Mitteil. Zool. Mus. Berlin, v. p. 28 (1910).

Moderately elongate, cuneiform, rather narrow; castaneous or fusco-castaneous, thickly clothed with greyish-brown pubescence. Antennæ filiform, very long in ♂, shorter in ♀, joints 1 and 2 shorter than 3, 3 in ♂ about one-third, and in ♀ one-half, the length of 4, 4-11 equal in length. Apical joint of maxillary palpi stout, securiform.

Fig. 3.

*Mordellistena mahena*, Kolbe. Posterior leg.

Pygidium long, acuminate, as long as hind tarsus. Posterior tibiae with 4 or 5, first joint of posterior tarsi with 3 or 4, and the second and third joints each with 2, oblique ridges.

Length (incl. pygid.)  $3\frac{1}{3}$ - $4\frac{1}{2}$  mm. (♂ ♀.)

*Loc.* Seychelles: Mahé, Long Island, Round Island. Félicité, Marie Anne.

This species was originally taken in Mahé by Brauer;

several examples were obtained by Mr. Scott in the same island in x. and xi. 1908 near Morne Blanc, not in the highest forests, but between 500 and 1000 feet. A few were collected at Long and Round Islands, small cultivated islets off Port Victoria, Mahé, vii. 1908. Several were also found in Félicité and Marie Anne Islands, xii. 1908, in a rather dry type of forest near sea-level.

Kolbe's description was made from a single example, and, as the antennal structure is not mentioned by him, it is not quite certain whether the name should be applied to this or the following species. The first ridge on the posterior tibiæ and first tarsal joint is at most feebly developed and often wanting. Amongst the series examined there are at least two of each sex with the genital organs extruded, so that there can be no mistake as to their identification.

## 21. *Mordellistena degressa*, sp. n.

Extremely like *M. mahena*, but differing from it in having the antennæ less elongate in both sexes (in ♂ about as long as in ♀ of *M. mahena*), comparatively short and subserrate in ♀, joints 3 and 4 small and equal in length in the two sexes, 5 twice as long as 4, 5-11 moderately elongate in ♂. Posterior tibiæ and tarsi as in *M. mahena*.

Length (incl. pygid.)  $3\frac{1}{4}$ - $4\frac{1}{2}$  mm. (♂ ♀.)

Loc. Seychelles: Mahé, Silhouette.

Nine specimens, eight of which are from Mahé. All are from the mountain-forests. These appear at first sight to be females of *M. mahena*; but as there is no corresponding variation in the development of the antennæ in the long series of the allied forms from the Seychelles, the examples with a short fourth joint must be separated from the rest. *M. degressa*, therefore, is based upon examples with seven, and *M. mahena* with eight, elongated antennal joints.

## 22. *Mordellistena partilis*, sp. n.

♂. Rather short, narrow, convex; black, the head, antennæ, mouth-parts, prothorax, anterior and intermediate legs, and the posterior tibiæ and tarsi in part, testaceous; the elytra variegated with cinereous and black pubescence, the latter condensed into a very large transverse patch at the base (not quite reaching the suture) and a common, broad, postmedian fascia (leaving a sharply defined submedian and apical fascia cinereous), the vestiture of the pygidium and under surface cinereous, that of the head and

prothorax flavo-cinereous. Antennæ moderately long, slender, joints 1 and 2 rather stout, 2 shorter than 1, 3 and 4 small, subequal in length, 5-10 longer than broad, subserrate. Apical joint of maxillary palpi stout, securiform. Prothorax transverse, rounded at the sides anteriorly, not wider than the elytra. Elytra relatively short, subparallel in their basal half. Pygidium long, acute, as long as posterior tarsus. Posterior tibiæ with 4, first joint of posterior tarsi with 3, and the second joint with 2, short oblique ridges, the third joint also with an indication of a single ridge.

♀. Similar to ♂, but with the prothorax infusate or black, the basal margin at most testaceous, the antennæ a little shorter.

Length (incl. pygid.)  $2\frac{1}{2}$ -3 mm. (♂ ♀.)

Loc. Seychelles: Mahé, Silhouette.

One male and four females—both sexes from Mahé, a female only from Silhouette. The Silhouette specimen is from near Mont Pot-à-eau, about 1500 feet; those from Mahé were all found in the forests above Cascade Estate at about 1000 feet. Easily distinguished from the other Seychelles forms by the sharply defined elytral markings, the single male with both the head and prothorax testaceous. The prothorax is more transverse than in *M. argutula*. The anterior femora are not ciliate in ♂.

### 23. *Mordellistena coleæ*, sp. n.

(Text-fig. 4, posterior leg.)

Moderately elongate, cuneiform, robust; fusco-castaneous or castaneous, thickly clothed with greyish-brown pubescence. Antennæ with joints 3 and 4 short, equal, 5 at least twice as long as 4, 5-11 rather broad, compressed, elongated, and 11 longer than 10, in ♂, 5-11 shorter and subserrate in ♀. Last joint of maxillary palpi rather narrow, elongate-triangular. Pygidium elongate, about as long as hind tarsus. Anterior tibiæ slender, sinuous within. Posterior tibiæ with 3 ridges—two very long and oblique, and a shorter apical one—and with from 3-5 stiff erect setæ along their lower edge in both sexes. First joint of posterior tarsi with 3, and the second joint with 2, oblique ridges, the third unarmed.

Length (incl. pygid.)  $3\frac{1}{2}$ - $5\frac{1}{2}$  mm. (♂ ♀.)

Loc. Seychelles: Mahé, Silhouette.

Numerous examples from each island. Extremely like *M. mahena* and *M. degressa*, but averaging larger in size, the

terminal joint of the maxillary palpi narrower and more elongate, the antennæ distinctly wider, with short fourth joint as in *M. degressa*, the posterior tibiæ strongly, sparsely setose along their lower edge, the third joint of the posterior tarsi without definite ridges. Three of the Silhouette specimens are labelled as having been bred from larvæ found

Fig. 4.



*Mordellistena colea*, Champion. Posterior leg.

in the wood of an endemic tree, the "Bilimbi marron," *Colea pedunculata*; another from the same locality is marked "bred from a pupa" found in same tree. All the examples are from various places in the mountain-forests, at altitudes ranging from about 1000 to 2000 feet.

#### 24. *Mordellistena septemcarinata*, sp. n.

Moderately elongate, narrow, convex, shining; ferruginous or castaneous, the eyes black, the under surface in part and the base of the pygidium black or piceous; thickly clothed with greyish-brown pubescence. Antennæ long in ♂, slightly shorter in ♀, slender, filiform, joints 3 and 4 short, 4 a little longer and wider than 3, subtriangular, 5-11 elongate, subequal, 5 about twice as long as 4. Apical joint of maxillary palpi moderately stout, subtriangular. Prothorax broader than long, not wider than the elytra. Elytra subparallel in their basal third, gradually narrowing from the middle, somewhat coarsely and not very densely

punctate, the interspaces shining. Pygidium long, becoming very slender beyond the middle, as long as the hind tarsus. Anterior tibiæ slender, sinuous within. Posterior tibiæ with 3, and the first two joints of the posterior tarsi each with 2, oblique ridges.

Length (incl. pygid.)  $3-3\frac{1}{2}$  mm. ( $\delta$   $\&$ .)

*Loc.* Seychelles: Mahé, Silhouette, Praslin.

Mahé; forest above Cascade Estate, and in the Mare aux Cochons district, in both cases over 1000 feet, also one specimen recorded from the low country; Silhouette, various places in the mountain-forests above 1000 feet; Praslin, one specimen from Côtes d'Or Estate.

A long series, mostly in very bad condition. Closely resembling *M. coleæ*, but smaller, narrower, and less cuneiform; the elytra subparallel and somewhat coarsely sculptured; the first joint of the posterior tarsi with two ridges only; the pygidium very slender.

#### 25. *Mordellistena dirempta*, sp. n.

Narrow, convex, shining; testaceous or ferruginous, the elytra often darker towards the sides and apex, the eyes and under surface black or piceous; thickly pubescent. Antennæ comparatively short, joint 3 very small, 4 slightly longer and wider, 5-10 broader, subtriangular, not much longer than broad, subequal, 11 longer than 10. Prothorax, elytra, and pygidium much as in *M. septemcarinata*. Anterior tibiæ slender, sinuous within, thickened towards the base ( $\delta$ ). Posterior tibiæ with 3 (the subapical one short), and the first two joints of posterior tarsi each with 2, oblique ridges.

Length (incl. pygid.)  $2\frac{1}{2}-3$  mm. ( $\delta$   $\&$ .)

*Loc.* Seychelles: Silhouette, Mahé, Praslin.

Silhouette, Mare aux Cochons and forest above, over 1000 feet; Mahé, high forest of Morne Blanc, and a specimen also from the low country; Praslin, Côtes d'Or Estate.

Described from about a dozen examples, other damaged individuals probably belonging here. These were at first supposed to be diminutive females of *M. septemcarinata*, coming as they do from each of the islands quoted; but, as both sexes appear to be represented in each series, this cannot be the case. *M. dirempta*, therefore, may be described as a rather short, small form of *M. septemcarinata*, with the antennal joints 5-10 subserrate and but little longer than broad.

#### 26. *Mordellistena argutula*, sp. n.

$\delta$ . Narrow, moderately elongate, convex; black, the head (a large transverse patch of variable extent on the vertex

excepted), mouth-parts, basal joints of the antennæ, anterior coxæ, femora, and tibiæ, and calcaria testaceous or rufo-testaceous; closely, uniformly fusco-cinereo-pubescent. Head very convex; antennæ slender, moderately long, joints 1 and 2 rather stout, 2 a little shorter than 1, 3 small, short, 4 subtriangular, 5-10 longer than broad, feebly subserrate; last joint of maxillary palpi stout, securiform. Prothorax moderately transverse, not wider than the elytra, rounded at the sides anteriorly. Elytra subparallel in their basal half. Pygidium long, acute, about as long as the posterior tarsi. Anterior femora beneath and anterior tibiæ at base fusco-ciliate, the latter sinuous within. Posterior tibiæ with two very long oblique ridges, in addition to the short subapical one. Posterior tarsi with joints 1 and 2 each with two oblique ridges.

♀. Similar to ♂, but with the head and the anterior legs in great part or entirely infusate, the antennæ a little shorter, the anterior femora and tibiæ not ciliate.

Length (incl. pygid.)  $2\frac{1}{2}$ -4 mm. (♂ ♀.)

Loc. Seychelles: Mahé, Round Island, Anonyme Island, Silhouette, Félicité.

A long series, almost all from low elevations. In Silhouette a large number of examples was swept from grass in the low coconut-planted country near the coast at Pointe Étienne, 17. ix. 1908; a few were also taken near Mare aux Cochons. In Mahé specimens were collected near Morne Blanc, 500-1000 feet; on the marshy coastal plains of Anse aux Pins and Anse Royale; and a few from over 1000 feet in the Mare aux Cochons district. Examples were also found in two cultivated islets, Anonyme and Round Island. Félicité: six specimens from a rather dry type of forest near sea-level.

A small, narrow, obscure form, with the head and anterior legs partly rufo-testaceous in ♂, the vestiture uniform, the prothorax rather long and not wider than the elytra, the pygidium long and acute.

#### EXPLANATION OF PLATE VI.

- Fig. 1. *Cacoplesia viriditincta*, Champion, ♂.
- Fig. 2. *Cacoplesia annulipes*, Champion, ♂.
- Fig. 3. *Stictodrya longipennis*, Champion, ♂.
- Fig. 4. *Mycteromimus insularis*, Champion, ♀.
- Fig. 5. *Eurygenius fragilicornis*, Champion, ♀.
- Fig. 6. *Xylophilus torticornis*, Champion, ♂.
- Fig. 7. Ditto. Antenna.
- Fig. 8. *Xylophilus seychellarum*, Champion, ♂.
- Fig. 9. *Xylophilus clavicornis*, Champion, ♀.
- Fig. 10. *Mordella peregrinator*, Champion, ♀.

XIII.—On new Species of Indian Curculionidæ.—Part III.  
By GUY A. K. MARSHALL, D.Sc.

Subfamily EREMNIÆ.

Genus PELTOTRACHELUS, nov.

*Head* continuous with the rostrum, the eyes comparatively small and widely separated. *Rostrum* about as long as the prothorax, its sides sloping outwards from the carinæ bounding the median area, the genæ more or less dilated, the apical emargination deep and triangular; the scrobes apical and short, visible from above; the lateral areas impressed and with two furrows—one running just below the dorso-lateral carina, the other passing from the lower corner of the scrobe to the lower margin of the eye; the buccal aperture extremely oblique and much longer than the lower surface of the rostrum, the mentum bearing only two setæ. *Antennæ* with the scape but little curved, subcylindrical, slightly thickened towards the apex, and reaching beyond the front margin of the thorax; the funicle variable; the club narrowly spindle-shaped. *Prothorax* transverse, the base deeply bisinuate and broader than the apex, the ocular lobes developed or not, but vibrissæ always present. *Scutellum* small. *Elytra* with the shoulders obliquely rounded and not prominent, the dorsal outline flat or only slightly convex, the declivity steep, the apices separately rounded, the striæ partly hidden by the dense scaling. *Legs* with the front coxæ nearer the anterior margin of the prosternum; the femora moderately clavate and with a small tooth; the tibiæ simple, the corbels of the hind pair quite open; the claws small and free.

Type, *Platytrachelus pubes*, Fst.

The species included in this genus were erroneously attributed by Faust to *Platytrachelus*, Schh., owing to his having wrongly identified the genotype, *P. pistacinus*, Boh. Some years ago, through the kindness of Dr. Taschenberg, I was able to examine the type of that species, which is in Germar's collection in Halle; it proved to be identical with *Amblyrrhinus viridanus*, Fst. (Stett. ent. Zeit. 1890, p. 74). *Platytrachelus* differs from *Peltotrachelus* principally in the structure of the rostrum, which has the median area broad and the sides vertical; the scrobes are therefore quite invisible from above and extend backwards for more than half the length of the rostrum. The only other species of



true *Platytrachelus* known to me are *Amblyrrhinus psittacinus*, Fst., and *Corigetus parvii*, Auriv., both of which occur in Indo-China.

The other described species of *Peltotrachelus* are *Platytrachelus propinquus*, Fst., *P. ovis*, Hell., *Cyphicerus juvenis*, Fst. (= *Mylocherus acaciæ*, Stebb.), *Acanthotrachelus albus*, Pasc., and *Mylocherus isabellinus*, Boh.

*Peltotrachelus cognatus*, sp. n.

♂ ♀. Colour black or piceous, with dense grey scaling and with the following denuded areas on the elytra:—A transverse patch just behind the scutellum, extending to about the fourth stria; a dentate transverse band before the middle, which is only broken at the suture; a similar but complete and more curved band behind the middle; these patches often partly obscured by whitish or yellowish powdering.

*Head* with the eyes lateral and almost flat; the forehead with a central fovea. *Rostrum* longer than its basal width, slightly narrowed from the base to beyond the middle, and dilated at the apex; the dorsal area broadly and rather deeply impressed; the submentum with a projecting tooth. *Antennæ* with the second funicular joint much longer than the first, the others longer than broad. *Prothorax* with the sides slightly rounded and shallowly constricted at the apex, the postocular lobes prominent, the dorsal anterior margin rounded; the upper surface with rather coarse confluent punctation, and with a very shallow transverse impression before and a small rounded one behind the middle on each side. *Elytra* nearly parallel-sided (♂) or dilated behind the middle (♀), the intervals distinctly broader than the shallow striæ and with short curved irregular setæ.

Length 6–7, breadth  $2\frac{1}{2}$ –3 mm.

MADRAS: Yercaud, 4500 ft., Shevaroy Hills (*T. Bainbrigge Fletcher*).

Very closely allied to *P. pubes*, Fst., but differing in its colouring and its larger and less convex eyes; the rostrum is longer and more deeply impressed, the prothorax is more narrowed in front, the shoulders of the elytra are less prominent, and the sides more dilated behind in the female.

*Peltotrachelus rugipennis*, sp. n.

Colour black, with rather thin pale green scaling, which is often more or less abraded.

*Head* with the eyes lateral, elongate, and only slightly

convex, the forehead thinly pubescent and without green scaling. *Rostrum* much longer than its width at the base, almost parallel-sided in the basal half, and strongly dilated anteriorly, the basal area broadly and rather deeply impressed, the median part of the submentum elevated into a sharp conical process with the point directed backwards. *Antennæ* with the scape gently curved and gradually thickened; the funicle with joint 2 longer than 1, and 3 to 7 longer than broad. *Prothorax* with the sides subparallel in the basal half and narrowed in front, the dorsal anterior edge very slightly rounded, the ocular lobes strongly produced; the upper surface with close confluent punctation which is not very distinct through the scaling, with a faint transverse impression before the middle and a deeper rounded impression on each side behind. *Elytra* with rows of large foveæ, the intervals very narrow and irregular; in the vicinity of the suture the spaces between the foveæ are slightly raised, so that the surface appears transversely rugose; the setæ extremely short, dense, and suberect.

Length  $5\frac{3}{4}$ –7, breadth  $2\frac{1}{2}$ –3 mm.

MADRAS: Anaimalai Hills (*H. L. Andrewes*).

*Peltotrachelus illobatus*, sp. n.

Black, with dense pale green or greenish-grey scaling throughout, the head and prothorax with a yellowish tinge.

*Head* with the eyes rather prominent and lateral; forehead with a short central stria. *Rostrum* longer than broad, very gradually dilated from the middle to the apex, the dorsal carinæ more elevated than usual and continued on to the forehead. *Antennæ* with the scape distinctly curved; the funicle with joint 2 longer than 1, the latter longer than 3 and 4 together, 5–7 much longer than broad. *Prothorax* with the sides almost straight and strongly narrowed from base to apex, the dorsal anterior margin straight, the ocular lobes absent, being replaced by a tuft of yellow vibrissæ, the upper surface rather rugosely punctate, especially towards the sides. *Elytra* broadest behind the middle (♀), with rather deep and coarsely punctate striæ, which, however, appear very narrow and finely punctate when the scaling is intact; the setæ mostly very short and depressed, but scattered among them a number of comparatively long erect setæ.

Length 7, breadth  $3\frac{1}{4}$  mm.

BURMA: Taung-ngu (*G. Q. Corbett*). CAMBODIA (*Mouhot*).

*Pellotrachelus smaragdus*, sp. n.

Black, with dense bright green scaling, the head usually with pinkish scales; sometimes the insect is covered with a more or less dense whitish coating over the green scaling.

*Head* with the eyes very small, prominent and lateral; forehead with a central fovea. *Rostrum* longer than broad, only slightly dilated at the apex, the dorsal area broadly impressed, the under surface normal and with no projection. *Antennæ* with the scape almost straight; the funicle with joint 2 nearly twice as long as 1, 1 hardly longer than 3, and 3 to 7 much longer than broad. *Prothorax* with the sides scarcely curved, only slightly narrower at the apex than at the base, the dorsal anterior margin straight, the ocular lobes absent, being replaced by a tuft of golden-yellow vibrissæ; the upper surface closely punctate and with a shallow fovea on each side behind the middle. *Elytra* with fine distinctly punctate striae and broad intervals where the scaling is intact, the striae being a good deal broader when the scaling is removed, but even then distinctly narrower than the intervals; the setæ extremely short, dense, and suberect.

Length 4-6, breadth 2-3 mm.

MADRAS: Nilgiri Hills (*Sir G. Hampson, H. L. Andrewes*).

A very distinct species. Apart from the absence of the ocular lobes, the facies is that of a typical *Pellotrachelus*.

## Genus MEIONOPS, nov.

*Head* separated from the rostrum by a very shallow transverse impression; the eyes widely separated, comparatively small, and almost circular. *Rostrum* rather broad and stout, longer than its basal width, the buccal aperture oblique, the apical emargination angular but rather shallow; the true scrobe apical and very short, the space from the scrobe to the eye broadly impressed. *Antennæ* elongate and comparatively slender; the scape cylindrical, abruptly clavate, and curved only towards the apex; the funicle with joint 1 much longer than 2, 3 to 7 subequal, and the club narrowly spindle-shaped. *Prothorax* simple, strongly transverse, the sides rounded, its greatest width almost or quite equal to that of the elytra, the apex narrower than the base, the latter truncate or faintly bisinuate, the ocular lobes not very prominent, broadly rounded and with short vibrissæ, the front coxæ placed in the centre of the prosternum. *Scutellum* small. *Elytra* with the base vertically truncate, its margin being

slightly raised, the shoulders feeble and obliquely rounded, punctato-striate, the intervals smooth and even. *Legs* with the femora strongly clavate and having a rather large tooth, all the tibiae sinuate internally near the base, the corbels of the hind pair entirely open, the tarsal claws free.

Type, *M. aspersus*, sp. n.

Allied to *Phytoscapus*, Schh., but differing from it in the very broad and rounded prothorax, the vertical basal margin of the elytra, and the small and widely separated eyes.

*Meionops aspersus*, sp. n.

Colour piceous, with chocolate-brown scaling and pale markings; the head fawn-coloured; the prothorax with a broad dorsal and narrower lateral stripe of yellowish-creamy scales; the elytra with a similarly coloured, broad, irregular, and broken lateral stripe, and with small pale spots on the disk, which often coalesce along the suture.

*Rostrum* only slightly widened at the apex, the dorsal area almost plane and with a fine central carina, the lateral area with a deep narrow furrow running towards the upper edge of the eye and a broader one beneath the scrobe. *Antennæ* with joints 3 to 7 of the funicle about as long as broad. *Prothorax* not quite as broad as the elytra at the shoulders, the base slightly bisinuate, the upper surface with shallow punctures and slightly granulate, the sculpture being almost hidden by the scaling. *Elytra* jointly sinuate at the base, the apices jointly rounded, slightly broader behind the middle, the striae shallow, with very large subquadrate punctures (somewhat hidden by scaling), the intervals almost plane and smooth, with minute subdepressed setæ.

Length  $5\frac{3}{4}$ –6, breadth  $2\frac{1}{2}$ –3 mm.

ASSAM.

*Meionops glaucinus*, sp. n.

Colour black, with dark greenish-grey scaling throughout.

*Rostrum* with the dorsal area almost plane and without a carina. *Antennæ* with joints 3 to 7 of the funicle evidently longer than broad. *Prothorax* as broad as the elytra at the shoulders, the base truncate, the apical portion shallowly constricted. *Elytra* truncate at the base, the sides parallel to beyond the middle, the punctures smaller.

In other respects agrees with *M. aspersus*, Mshl.

Length 5, breadth  $2\frac{1}{4}$  mm.

W, BENGAL: Chota Nagpur (Cardon).

## Subfamily ANTHONOMINÆ.

## Genus ONYCHOCNEMIS, nov.

*Head* exerted, subconical; the eyes lateral, small, almost circular. *Rostrum* broad, flattened dorso-ventrally, longer than the head or the front tibia, almost straight, deflected, forming a continuous line with the head, and with the apical margin entire; the scrobes narrow and deep, beginning at about one-third from the apex and continued obliquely to beneath the base of the rostrum; the mentum small, subquadrate, about as long as its supporting peduncle, convex, impunctate, and very shining. *Antennæ* short, geniculate; the scape almost straight, clavate, reaching the middle of the eye; the funicle 7-jointed, joint 1 swollen and longer than any of the others, 2 subconical and as long as broad, the remainder strongly transverse, very closely packed, and rapidly widening outwardly, joint 7 being closely annexed to the club, which is broadly ovate and 3-jointed. *Prothorax* without postocular lobes, and with the base bisinuate. *Scutellum* distinct, circular. *Elytra* oblong, broader than the prothorax, entirely covering the pygidium, with distinct shoulders and ten striæ. *Legs* short and stout; the hind coxæ ovate, not reaching the edge of elytra; the femora moderately clavate and not toothed, the hind pair not nearly reaching the apex of the elytra; the tibiæ almost straight, slightly compressed, strongly uncinatè at the apex, and also with a short sharp mucro projecting perpendicularly from the inner angle; the tarsi broad, joint 2 transverse, 3 broadly lobate, 4 short, the lower surface clothed with fine pale pubescence, which is sparse on the two basal joints, the claws very small and connate at the base. *Sternum*: the prosternum very short, with the front margin shallowly sinuate, the coxæ in the middle and narrowly separated; the mesosternum with the epimera not ascending and broadly separating the episterna from the elytra, the intercoxal process broadly truncate at the apex; the metasternum between the coxæ about as long as the middle coxæ, the episterna comparatively broad. *Venter* with the intercoxal process broadly rounded, the two basal segments fused together and delimited only by an almost straight shallow stria, the intermediate segments not angulated externally, 2 almost as long as 3 + 4 in the middle, and 5 but little longer than 4.

Type, *Onychocnemis careyæ*, sp. n.

Allied to the European *Bradybatus*, Germ., and the South-African *Thamnobius*, Schh. The former genus differs in its

much longer, more slender, and cylindrical rostrum, its simply uncinatæ tibiæ, free and bifid tarsal claws, and dentate front femora. In *Thamnobius* the rostrum is also more cylindrical, the scape does not exceed the front margin of the eye, the tibiæ are merely uncinatæ (not mucronate, as stated by Lacordaire), and the tarsal claws are free and appendiculate.

*Onychocnemis careyæ*, sp. n.

♂ ♀. Colour red-brown, shining and sparsely clothed with short recumbent white setæ; the head darker; the elytra with the entire suture blackish brown, as well as a large common patch extending from the base to beyond the middle and laterally as far as the fifth stria, its outline being very similar to that of the elytra; the mesosternum, metasternum, tarsal claws, and the two apical hooks of the tibia also dark brown or blackish.

*Head* rugosely punctate, the forehead a little narrower than the base of the rostrum and broader than the eye. *Rostrum* very gradually widened from base to apex, rugosely punctate above from the base to the end of the scrobe, the apical area more lightly punctate (♂) or impunctate (♀). *Prothorax* subconical, almost as long as its width at the base, gradually narrowed from there to the apex, the sides gently rounded, without any anterior constriction, the basal angles nearly right angles, the base angularly produced in the middle, the apical margin very shallowly sinuate dorsally and oblique at the sides; the upper surface with coarse reticulate punctation throughout and with a median stripe of denser pale recumbent setæ. *Elytra* almost parallel-sided from the shoulders to well behind the middle, broadly rounded behind, the apices continuous, the basal margin slightly raised and almost straight from the second stria to the shoulders; the striae broad, containing deep closely-set punctures, which diminish behind, the intervals scarcely broader than the striae, almost flat and finely aciculate, the posterior callus nearly obsolete; the dorsal outline flat from the base to the middle, then gradually declivous. *Legs* coarsely punctate and clothed with curved white setæ.

Length 2-2½, breadth 1-1¼ mm.

MYSORE: Madhavagiri (*H. H. Mann*, Pusa Coll.).

This species was found on the leaves of the jak-fruit tree (*Careya arborea*).

## Subfamily OMOPHORINÆ.

## Genus TELUROPUS, nov.

*Head* globose, with the eyes lateral. *Rostrum* stout, about as long as the front tibia, somewhat depressed, the apical margin very shallowly sinuate; the scrobes invisible from above, beginning at some distance from the apex, curving rapidly downwards behind the antennæ, and ending in a flattened punctate area almost on the lower surface of the base of the rostrum; mandibles stout, tridentate; mentum small and square, about equal in length to the peduncle of the submentum, and not broader than the lateral space on each side of it. *Prothorax* with the basal margin deeply bisinuate; the anterior margin oblique at the sides and without any postocular lobes. *Scutellum* distinct, almost circular. *Elytra* short and broad, with ten complete striæ; the inflexed lateral margin unusually narrow, involving only the tenth stria, and without true epipleuræ. *Wings* fully developed. *Legs* short and stout; the femora only slightly clavate and each with a small tooth, the hind pair scarcely reaching the apex of the elytra; the tibiæ with the external apical angle strongly uncinatè, and the inner angle with a sharp mucro as well; the tarsi short and broad, the second joint twice as broad as long, the fourth projecting only a short distance beyond the third, the claws simple and stout. *Sternum* with the front coxæ very widely separated and placed behind the middle, the space between them quite flat; the median coxæ still further apart, the side-pieces of the mesosternum fused together but divided by a stria, the suture between the mesosternum and episternum entirely obliterated, and the intercoxal piece broadly truncate; the length of the metasternum between the coxæ not greater than that of the median coxæ, the episterna as broad as the base of the mid-femora and fused with the metasternum, but the line of junction quite distinct, the epimera imperceptible; the hind coxæ as widely separated as the middle pair. *Venter* short, with segment 2 nearly as long as 3+4 and separated from 1 by a deep straight incision, the intercoxal process very short and broad, with an angular projection in the middle, and segments 2 and 3 angulate externally.

Type, *Teluropus subcostatus*, sp. n.

In general form the only known species bears considerable resemblance to the African genus *Omophorus*, Schlh.\*, and

\* In most collections this genus stands under the later name *Metatygus*, Pasc. *M. turritus*, Pasc., is a synonym of *O. stomachosus*, Boh., while *M. parvus*, Fst., is identical with *O. indispositus*, Boh., the type of which is now in the Oxford University Museum (Sommer's collection).

the Fijian *Physarchus*, Pasc., except that the shoulders of the elytra are much less prominent. But both these genera differ, *inter alia*, in the absence of the inner apical mucro on the tibiæ, and in having the front coxæ contiguous and the hind pair much closer together than the middle pair.

*Teluropus ballardi*, sp. n.

♂. Dark red-brown, fairly closely clothed with short, curved, golden-brown setæ.

*Head* rugosely punctured throughout, the forehead almost as broad as the base of the rostrum, transversely flattened and with a central fovea; the eyes almost circular, their greatest depth at about one-fourth from the hind margin. *Rostrum* stout, parallel-sided, and porrect from the base to a little beyond the middle, thence slightly widened and curved downwards, somewhat flattened longitudinally at the sides in the basal half, and rugosely punctured throughout right up to the apex. *Antennæ* short; the scape stout, slightly compressed, strongly clavate, and coarsely punctate; the funicle with joint 1 rather longer than 2, and joints 2 to 7 of about equal width and widening regularly outwards, 7 being closely fitted to the club, which has three distinct joints. *Prothorax* broader than long, broadest near the base and rapidly narrowing in front, with a broad apical constriction, the anterior margin straight, the base with a large median lobe, which is emarginate at its apex; the upper surface convex, coarsely and confluent punctate throughout, and with two low broad elevations in the middle of the disk; these merge and slope gradually away behind, but in front they are abruptly narrowed where they cross the apical constriction and enclose a large rounded depression between them; below these prominences on each side is another much lower rounded elevation. *Elytra* together nearly as broad as long, parallel-sided from the shoulders to beyond the middle, and very broadly rounded behind; each elytron strongly lobate at the base, the greatest depth of the lobe being at the third interval, which bears a slight basal callus; the juxta-basal area slopes steeply forwards from a transverse postbasal ridge, which bears a rounded prominence on intervals 3 and 5; a little behind this is a short costate elevation on interval 3 and a less distinct one on 5; the striæ are deep and strongly punctate and the intervals are rugose, the alternate ones being slightly more convex. *Legs* rugosely punctate, the femora with scattered granules, set with curved suberect



setæ; the anterior pairs of tibiæ rather sharply angulate on the lower surface not far from the base.

Length  $4\frac{1}{2}$ –5, breadth  $2\frac{1}{2}$ –3 mm.

MADRAS: Coimbatore (*E. Ballard*, type). MYSORE: Madhavgiri, on leaves of jak-fruit, *Careya arborea* (*H. H. Mann*, Pusa Coll.).

#### Subfamily ISORRHYNCHINÆ.

##### *Phænomerus angulicollis*, sp. n.

♀. Colour black, sparsely clothed with rather stout, transversely recumbent, pale yellowish, hair-like scales, having the following patches apparently bare, but really clothed with similar black hairs which are not very conspicuous:—A large transverse patch on the anterior half of the prothorax, and two irregular patches on each elytron, one before and the other behind the middle.

*Head* with scattered punctures, the eyes a little more widely separated than in *P. sundewalli*. *Rostrum* red-brown, the thickened basal portion forming about one-fourth of the whole, and not sulcate, but with two posteriorly convergent rows of fine punctures on the disk; the scrobes continued to beyond the middle as a shallow punctate furrow, and with a fine stria just above them. *Prothorax* at least two and a half times as long as its basal width, the sides obtusely angulated in front of the middle, the dorsal margin bounded by a fine carina in the basal half, the upper surface with reticulate punctures which are longitudinally subcoalescent, leaving a distinct smooth central carina. *Elytra* narrowly cylindrical, about as broad as the prothorax at its angulation, with shallow striæ containing closely set transverse punctures, the intervals narrowly carinate, except the four outer ones, which are broader and almost flat. *Legs* similar to those of *P. sundewalli*, except that the large tooth on the elongate hind femora is more deeply sinuate at the base of its posterior edge, so that this edge is distinctly angulated in the middle.

Length  $3\frac{1}{4}$ , breadth  $\frac{3}{4}$  mm.

BENGAL: Sanderbans, 13. ii. 1915 (*C. F. C. Beeson*).

Very similar superficially to *P. sundewalli*, Boh., but distinguished by its obviously narrower build, more widely separated eyes, the lateral angulation and basal lateral carina of the prothorax, and the shape of the tooth on the hind femora.

Found in burrows in sundri-trees (*Heritiera littoralis*).

*Phænomerus brevirostris*, sp. n.

♂ ♀. Colouring similar to that of *P. angulicollis*, but the pale scales more generally distributed, so that the dark patch on the prothorax is indistinct and those on the elytra are very much reduced.

*Head* with close shallow punctures, the forehead broad, about twice the breadth of the funicle. *Rostrum* unusually short and stout, the thickened basal portion forming half (♀) or more than half (♂) its length, and bearing two or four shallow furrows, the apical area smooth and sparsely punctate; the scrobe continued to well beyond the middle in both sexes, but without any distinct furrow above it. *Antennæ* short, all the joints of the funicle except the first very strongly transverse, the club shorter and more obtuse than in *P. sundewalli*. *Prothorax* about twice as long as broad, parallel-sided from the base to beyond the middle, thence narrowing gradually to the apex, the upper surface simply reticulate, the punctures not coalescing longitudinally, with an indistinct central costa. *Elytra* cylindrical, very slightly broader than the prothorax, with coarsely punctate striæ, the dorsal intervals narrow, subcarinate, and crenulate. *Legs* as in *P. sundewalli*, except that the hind femora are much shorter, extending only a short distance beyond the apex of the elytra, the basal stem is more rapidly widened, and the large tooth is more deeply sinuate at the base of its posterior edge, so that the edge is distinctly angulated in the middle.

Length 3, breadth  $\frac{3}{4}$  mm.

UNITED PROVINCES: Khairabenda, Khash Forest, 29. xi. 1913 (C. F. C. Beeson).

This species can be readily distinguished from both *P. sundewalli* and *P. angulicollis* by its short rostrum and hind femora, and its broad forehead. Found in burrows in dead sal-tree (*Shorea robusta*). Mr. Beeson informs me that all the three species of *Phænomerus* mentioned here occurred in burrows of Scolytidæ &c., and he is of opinion that they are predaceous upon those beetles.

XIV.—*A Revision of the Clupeid Fishes of the Genus Pellonula and of Related Genera in the Rivers of Africa.* By C. TATE REGAN, M.A.

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*PELLONULA* and its allies are distinguished from *Clupea*, *Sardinella*, &c., by the stronger dentition and by the absence of the anterior supramaxillary bone.

*Synopsis of the Genera.*

I. Abdominal scutes sharply keeled; præmaxillary teeth rather strong.

A. Lower jaw not or but little projecting; anterior mandibular teeth enlarged, but no strong canines in either jaw.

1. D. 16-18, above or just behind pelvics. A. 16-21. Scales about 45/11-15. Vertebrae 42-43. Supramaxillary large.

1. *Pellonula*.

2. D. 12-14, above interspace between pelvics and anal.

A. 20-21. Scales 33/8. Vertebrae 43 . . . . . 2. *Pæcilothrissa*.

A. 21-25. Scales 38-42/10-12. Vertebrae 39-40. . . . . 3. *Microthrissa*.

3. D. 13-14, above pelvics. A. 17-18, far behind dorsal. Scales 40-44/10. Vertebrae 42. Supramaxillary small.

4. *Potamothrissa*.

B. Lower jaw strongly projecting.

Præmaxillaries with an inner series of 2 or 3 strong canine-like teeth on each side; anterior teeth of lower jaw enlarged. . . . .

5. *Cynothrissa*.

Præmaxillary teeth uniserial, with a canine on each side; lower jaw with a pair of strong anterior canines . . . . .

6. *Odaxothrissa*.

II. Abdominal scutes in front of pelvic fins feebly keeled; præmaxillary teeth small.

Maxillary narrow proximally and expanded distally;

tongue and palate toothless . . . . . 7. *Stolothrissa*.

Maxillary broad throughout its length; a patch of teeth on each palatine and a strip on tongue . .

8. *Limnothrissa*.

1. *PELLONULA*, Günth. 1868.

Cat. Fish. vii. p. 452.

Form elongate, compressed; abdomen sharp-edged. Mouth moderate, terminal, with the lower jaw a little projecting; upper jaw without median notch; maxillary of a narrow proximal and an expanded distal part; in front of the narrow part a ligament runs from the end of the præmaxillary to the broad part of the maxillary; a single well-developed supra-maxillary. Teeth in jaws uniserial, conical, acute; præmaxillary teeth rather strong, unequal, without well-marked canines; mandibular teeth enlarged anteriorly; maxillary teeth minute; a patch of conical teeth on each palatine; an elongate patch of small teeth on tongue. 6 branchiostegals. Scales with entire edges, moderate, in a longitudinal series one to each myotome; ventral scutes sharply keeled and acutely pointed, commencing on or behind the thoracic keel formed by the hypocoracoids. Dorsal of 16-18 rays, anal of 16-21. Pelvics 8-rayed, below or a little in advance of dorsal. Vertebrae 42 or 43. A bluish-silvery lateral band.

*Pellonula modesta*, Fischer (Jahrb. Hamb. Wiss. Anst. ii. 1885, p. 75), from Eloby, is placed by Boulenger in the synonymy of *P. vorax*, but unless the description is quite incorrect (teeth in jaws minute, tongue and palate toothless, no lateral band, &c.) it is not a *Pellonula* at all, and is most likely a *Sardinella*.

A species from the coast of Brazil, described by Steindachner as *Pellonula bahiensis* (Sitzungsb. Akad. Wien, lxxx. 1, 1880, p. 181, pl. iii. fig. 2), of which *Sardinella pernambucana*, Schreiner & Ribeiro (Arch. Mus. Rio Janeiro, xii. 1903, p. 72), appears to be a synonym, evidently belongs to the genus *Heringia*, Fowler, 1911 (*Rhinosardinia*, Eigenmann, 1912), the type of which is *H. amazonica*, Steind., from the Amazon and Guiana.

### *Synopsis of the Species.*

- |  |                        |
|--|------------------------|
| 26-30 gill-rakers on lower part of anterior arch. Depth 3 to 4 in the length; caudal peduncle as long as deep .....    | 1. <i>vorax</i> .      |
| 27 gill-rakers on lower part of anterior arch. Depth 5 in the length; caudal peduncle a little longer than deep .....  | 2. <i>leonensis</i> .  |
| 33 gill-rakers on lower part of anterior arch. Depth 4 in the length; caudal peduncle $1\frac{1}{2}$ as long as deep . | 3. <i>stanleyana</i> . |

#### 1. *Pellonula vorax*.

*Pellonula vorax*, Günth. Cat. Fish. vii. p. 452 (1868).

*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156, fig. 124 (1909).

Depth of body 3 to 4 in the length, length of head  $3\frac{1}{2}$  to  $4\frac{1}{2}$ . Snout nearly equal to diameter of eye, which is 3 to  $3\frac{3}{4}$  in length of head; maxillary extending to below anterior margin or anterior part of eye; lower jaw a little projecting. 26 to 30 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal series, 14 in a transverse series; ventral scutes 13-15 + 8-10. Dorsal 16-18; origin equidistant from end of snout and base of caudal, or nearer snout. Anal 18-21. Pelvics varying somewhat in position, rarely entirely below the dorsal, sometimes entirely in advance of it. Caudal peduncle as long as deep. Vertebrae 42.

West Africa, from the Senegal to Angola.

Numerous examples, measuring up to 140 mm. in total length.

This species may occur in the Lower Congo, but none of the specimens from the Congo enumerated by Boulenger belongs to it; I refer specimens 18 and 19 to *Cynothrissa*

*ansorgii*, 20-23 and 24-25 to *Microthrissa parva*, 26 to *Potamothrissa acutirostris*, 27 and 28 to *Pæcilothrissa congica*, and 29 and 30 to *Pellonula stanleyana*.

## 2. *Pellonula leonensis*.

*Pellonula leonensis*, Bouleng. Cat. Afr. Fish. iv. p. 172, fig. 111 (1916).

Depth of body 5 to  $5\frac{1}{2}$  in the length, length of head  $3\frac{3}{4}$  to 4. Snout nearly as long as diameter of eye, which is 3 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; lower jaw a little projecting. 27\* gill-rakers on lower part of anterior arch. 45 scales in a longitudinal series, 11 or 12 in a transverse series; ventral scutes 13-14+8-9. Dorsal 16; origin equidistant from end of snout and base of caudal. Anal 16-17. Pelvics below origin or anterior rays of dorsal. Caudal peduncle a little longer than deep.

Sierra Leone.

Two specimens, 57 mm. long, from the North Sherbo District.

## 3. *Pellonula stanleyana*, sp. n.

*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156 (1909).

Depth of body 4 in the length, length of head  $4\frac{1}{4}$ . Snout as long as diameter of eye, which is  $3\frac{1}{2}$  in length of head; maxillary extending to below anterior margin of eye; lower jaw a little projecting. 33 gill-rakers on lower part of anterior arch. 45 scales in a longitudinal series, 14 in a transverse series; ventral scutes 14+9. Dorsal 16-17; origin nearer to end of snout than to base of caudal. Anal 18. Pelvics below anterior rays of dorsal. Caudal peduncle  $1\frac{1}{2}$  as long as deep. Vertebrae 43.

Stanley Falls.

Two specimens, 110 mm. in total length; one of these is a skeleton, but I have been able to count the gill-rakers.

## 2. *PÆCILOTHRIS*, gen. nov.

Closely related to *Pellonula*, differing in that the scales in a longitudinal series are less numerous than the myotomes, the supramaxillary bone is rather small, and the tongue is toothless. Dorsal fin of 13 rays, above the interspace between pelvics and anal, the last with 20-21 rays. Scales  $33/8$ . Vertebrae 43.

\* I find 27 gill-rakers on the lower part of the anterior arch in each of the type-specimens, which I have examined under a binocular microscope.

*Pæcilothrissa congica*, sp. n.*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156 (1909).

Depth of body 4 in the length, length of head  $4\frac{1}{4}$ . Snout a little shorter than diameter of eye, which is  $2\frac{3}{4}$  in length of head; jaws equal anteriorly; maxillary extending to vertical from anterior edge of eye; maxillary teeth quite distinct; 19 gill-rakers on lower part of anterior arch. 33 scales in a longitudinal series, 8 in a transverse series; ventral scutes 11-12+9-10. Dorsal 13; origin equidistant from end of snout and base of caudal. Anal 20-21. Pelvics well in advance of dorsal. Caudal peduncle longer than deep. Lateral band narrow, present only on posterior half of fish. Vertebrae 43.

Congo.

Two specimens, 55 and 60 mm. in total length, from Coquilhatville and from Monsembe.

## 3. MICROTHRIS, Bouleng. 1902.

Ann. Mus. Congo, Zool. ii. p. 26.

Scarcely generically distinct from *Pellonula*, but tongue toothless, dorsal fin of 12-14 rays and anal of 21 to 25, and pelvics in advance of dorsal. Scales 38-42/10-12. Vertebrae 39-40.

1. *Microthrissa parva*, sp. n.*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156 (1909).

Depth of body 4 to 5 in the length, length of head about 4. Snout a little shorter than diameter of eye, which is rather more than  $\frac{1}{2}$  the length of head; maxillary extending to vertical from anterior edge of eye; lower jaw a little projecting. 26 or 27 gill-rakers on lower part of anterior arch. 40 to 42 scales in a longitudinal series, 10 or 11 in a transverse series; ventral scutes 12-13+7-8. Dorsal 12-14; origin nearly equidistant from end of snout and base of caudal. Anal 21-23, not extending forward to below dorsal. Pelvics in advance of dorsal. Caudal peduncle longer than deep. 40 vertebrae.

Upper Congo.

Two specimens of 40 mm. from Coquilhatville and three of 30 mm. from the Tumba Lake.

2. *Microthrissa royauxi*.

*Microthrissa royauxi*, Bouleng. Ann. Mus. Congo, ii. 1902, p. 26, and Cat. Afr. Fish. i. p. 161, fig. 129 (1909).

Depth of body  $3-3\frac{1}{2}$  in the length, length of head 4. Snout shorter than diameter of eye, which is 3 in length of head; jaws equal anteriorly; maxillary with minute teeth, extending to below anterior margin of eye; 14 gill-rakers on lower part of anterior arch. 38 to 40 scales in a longitudinal series, 12 in a transverse series; ventral scutes 12-13+6-7. Dorsal 13; origin equidistant from end of snout and base of caudal, behind the 8-rayed pelvics. Anal 23 (-25), extending forward nearly to below end of dorsal. Caudal peduncle a little deeper than long. 39 vertebrae.

Ubanghi R.

One of the types, 55 mm. in total length, from Banzyville.

## 4. POTAMOTHRISSE, gen. nov.

Closely related to *Pellonula*, but maxillary narrow, supra-maxillary bone quite small, and no teeth on tongue or on maxillary. Dorsal fin of 13 or 14 rays, placed well forward, its origin much nearer to end of snout than to base of caudal, above or in advance of first ray of pelvics; anal of 17 or 18 rays, far behind dorsal. Scales 40-44/10. Vertebrae 42.

1. *Potamothrissa obtusirostris*. (Fig. 1, 2.)

*Pellonula obtusirostris*, Bouleng. Cat. Afr. Fish. i. p. 158, fig. 126 (1909).

Jaws equal anteriorly. 16 gill-rakers on lower part of anterior arch. Ventral scutes 9-10+9-10.

Aruwimi River, Congo.

Two specimens, 72 mm. in total length.

2. *Potamothrissa acutirostris*.

*Pellonula acutirostris*, Bouleng. Cat. Afr. Fish. i. p. 159, fig. 127 (1909).

Lower jaw shorter than upper. 19 gill-rakers on lower part of anterior arch. Ventral scutes 12-13+10-12.

Upper Congo.

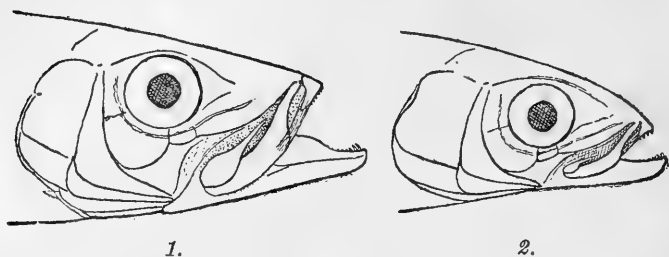
Five specimens, up to 75 mm. in total length.

## 5. CYNOTHRISSE, gen. nov.

Differs from *Pellonula* in the very prominent lower jaw and in the presence of an inner series of præmaxillary teeth,

comprising 2 or 3 strongly enlarged teeth on each side. Vertebrae 42.

Fig. 1.



Heads of 1. *Cynothrissa mento*, 2. *Potamothrissa obtusirostris* ( $\times 2\frac{1}{2}$ ).

1. *Cynothrissa mento*, sp. n. (Fig. 1, 1.)

*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156.

Depth of body 4 in the length, length of head (without lower jaw)  $3\frac{2}{3}$ . Snout longer than diameter of eye, which is  $3\frac{3}{4}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 19 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal series, 14 in a transverse series; ventral scutes 15+9. Dorsal 17; origin above base of pelvis, equidistant from end of snout and base of caudal. Anal 21. Caudal peduncle longer than deep.

Nigeria.

A single specimen, 130 mm. in total length, from Agberi, Southern Nigeria.

This new species is distinguished from *C. ansorgii* by the more slender form, fewer gill-rakers, and more numerous anal rays.

2. *Cynothrissa ansorgii*.

*Pellonula vorax* (part.), Bouleng. Cat. Afr. Fish. i. p. 156 (1909).

*Odaxothrissa ansorgii*, Boulenger, *op. cit.* iv. p. 172, fig. 112 (1916).

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head (without lower jaw)  $3\frac{2}{5}$  to 4. Snout as long as or longer than diameter of eye, which is 3 to 4 in length of head; maxillary extending to below anterior  $\frac{1}{3}$  or middle of eye. 23 to 25 gill-rakers on lower part of anterior arch. 42 to 45 scales in a longitudinal series, 14 or 15 in a transverse series; ventral scutes 13-16+9-11. Dorsal 15-17; origin



above or immediately behind base of pelvics, nearly equidistant from base of caudal and end of snout. Anal 17-19. Caudal peduncle as long as deep. Vertebrae 42.

Lower Congo and Angola.

Nine specimens, 110 to 160 mm. long, including the types from Angola and two from Boma and from Vivi, Lower Congo.

## 6. *ODAXOTHRISSA*, Bouleng. 1899.

Differs from *Pellonula* in the very prominent lower jaw, with a pair of strong canines anteriorly; præmaxillary teeth uniserial, with a canine on each side.

### 1. *Odaxothrissa vittata*, sp. n.

*Odaxothrissa losera* (part.), Bouleng. Cat. Afr. Fish. i. p. 160 (1909).

Depth of body  $4\frac{1}{4}$  in the length, length of head  $3\frac{2}{5}$ . Snout longer than diameter of eye, which is 4 in length of head; maxillary extending to below middle of eye; canines very strong. Gill-rakers shorter than gill-filaments, 22 or 23 on lower part of anterior arch. 45 scales in a longitudinal series, 14 in a transverse series; ventral scutes 12+9. Dorsal 16; origin a little nearer base of caudal than end of snout, immediately behind base of pelvics. Anal 21. Caudal peduncle  $1\frac{1}{3}$  as long as deep. A well-defined silvery lateral band.

Ubanghi River.

A single specimen, 110 mm. long, from Banzyville.

### 2. *Odaxothrissa losera*.

*Odaxothrissa losera*, Bouleng. Ann. Mus. Congo, Zool. i. 1899, p. 64, pl. xxxi. fig. 1.

Depth of body equal to or a little less than length of head, which is  $3\frac{1}{2}$  in the length of fish. Snout a little longer than diameter of eye, which is  $3\frac{2}{3}$  to  $4\frac{1}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  or middle of eye. 27 gill-rakers on lower part of anterior arch. 44 to 46 scales in a longitudinal, 14 in a transverse series; ventral scutes 11+9. Dorsal 16-17; origin equidistant from end of snout and base of caudal, immediately behind base of pelvics. Anal 21-22. Caudal peduncle as long as deep. Lateral band vestigial.

Upper Congo.

The above description is based on one of the types, a specimen of 85 mm. from Coquillhatville, and on the figure of the larger type-specimen, 160 mm. long. In the smaller fish the gill-rakers are rather longer than the gill-filaments, but in the larger they are said to be much shorter and to number only 18 on the lower part of the anterior arch; this may be a misprint for 28, or possibly in the adult the anterior gill-rakers may be vestigial.

#### 7. *STOLOTHRIS*, gen. nov.

Mouth formed as in *Pellonula*, but teeth in jaws quite small and no teeth on palate or tongue. Abdomen in front of pelvic fins rounded, with the scutes but weakly keeled; scutes behind pelvic fins strongly keeled and acutely pointed. Vertebrae 44.

#### *Stolothrissa tanganica*, sp. n. (Fig. 2, 2.)

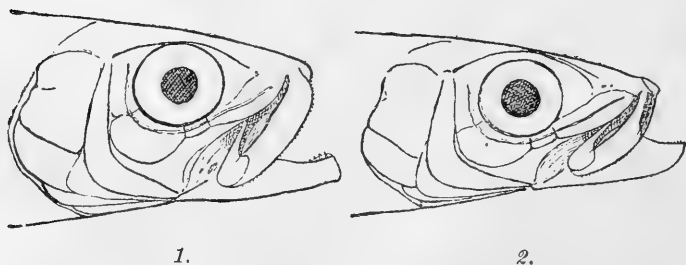
*Pellonula miodon* (part.), Bouleng. Cat. Afr. Fish. i. p. 157 (1909).

Depth of body about 6 in the length, length of head  $3\frac{1}{2}$  to 4. Snout rather longer than diameter of eye, which is  $3\frac{1}{2}$  in length of head; maxillary not or barely reaching vertical from anterior margin of eye; lower jaw slightly projecting. 40 to 42 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal and 13 in a transverse series; ventral scutes 13-14+8-9. Dorsal 15; origin nearly equidistant from end of snout and base of caudal, Anal 17. Pelvics below or a little in advance of middle of dorsal. Lateral band broad.

Tanganyika.

Four specimens, 80 to 95 mm. in total length, from Vua and Ndanvie.

Fig. 2.



Heads of 1. *Limnothrissa miodon*, 2. *Stolothrissa tanganica* ( $\times 2$ ).

## 8. LIMNOTHRISSA, gen. nov.

Maxillary broad throughout its length, its dentigerous margin extending right up to the præmaxillary; latter with quite small teeth, but dentition of lower jaw, palatines, and tongue as in *Pellonula*. Abdomen in front of pelvic fins rounded, with scutes but weakly keeled; scutes behind pelvic fins strongly keeled and acutely pointed. Vertebrae 44.

*Limnothrissa miodon*. (Fig. 2, 1.)

*Pellonula miodon* (part.), Bouleng. Cat. Afr. Fish. i. p. 157, fig. 125 (1909).

Depth of body  $4\frac{1}{2}$  in the length, length of head  $3\frac{2}{3}$  to 4. Snout as long as diameter of eye, which is  $3\frac{1}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; lower jaw slightly projecting. 31 to 33 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal and 14 in a transverse series; ventral scutes 13-14+10-11. Dorsal 15; origin equidistant from end of snout and base of caudal. Anal 16-18. Pelvics below middle or anterior part of dorsal. Lateral band broad.

Tanganyika.

Four specimens, 100. to 140 mm. in total length, from Ndanvie, Tembwi, and Kasakalewa; also some young examples not included in the description.

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XV.—*New Species of Tabanidæ from Australia and the Fiji Islands.* By GERTRUDE RICARDO.

THE identification of species and descriptions of new species contained in this paper are from specimens forwarded to Mr. Marshall by Dr. E. W. Ferguson and Dr. J. Burton Cleland.

One new species from the Fiji Islands, the type being in the British Museum Coll., is included. The types of all the new species will be presented to the British Museum by the Imperial Institute of Economic Entomology, with the exception of a few species belonging to the South Australian Museum and the National Museum, Victoria; in these cases, paratypes are kept for the British Museum.

## PANGONINÆ.

*Diatomineura ruficornis*, Macquart, Dipt. Exot., Suppl. i. p. 25 (1846); Walker, List Dipt. pt. v., Suppl. i. p. 142 (1854); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 113 (1900).

Females and males from the summit of Mt. Wellington, Tasmania.

I believe these specimens are Macquart's species, the type of which was examined by me at Lille in 1906, and the following note made of it:—"Palpi with the first joint short, the second long, flattened at base, broad, ending in a fine point. Subcallus fulvous, forehead darker. Thorax blackish, with yellowish tomentum; this describes it better than Macquart's remarks, the stripes he speaks of consist of pubescence, sides with yellow pubescence; the other details of his description are correct."

This species is very probably identical with *Diatomineura constans*, Walker, as suggested by Mr. White.

*Diatomineura constans*, Walker, Dipt. Saund. i. p. 15 (1850); Ricardo, Ann. & Mag. Nat. Hist. (7) v. pp. 113, 118 (1900); White, Royal Soc. Tasmania, 1915, pt. ii., Diptera Brachycera of Tasmania, p. 20.

Nine females from Waratah, Tasmania (Lea).

One female from Hobart (Lea).

*Diatomineura auriflua*, Donovan, Gen. Illustr. Ent. Hym. et Dipt. (1805) [*Tabanus*]; Wied. Ausszweifl. Ins. i. p. 194 (1848) (*Pangonia*); Ricardo, Ann. & Mag. Nat. Hist. (7) v. pp. 112, 119 (1900); id. (8) xvi. p. 27 (1915); White, Royal Soc. Tasmania (1915), pt. ii., Diptera Brachycera Tasmania, p. 19.

[*Pangonia solida*, Wlk.]

[*Pangonia dives*, Macq.]

One male and one female from Mt. Washington, Tasmania (Lea).

Two males and one female from Devonport, Tasmania (Lea).

*Diatomineura brevirostris*, Macq. Dipt. Exot., Suppl. iv. p. 326 (1842); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 113 (1900); id. (8) xvi. p. 29 (1915).

Two females from Dorrigo, New South Wales (*W. Heron*).

Six females from Clarence River, New South Wales (A. & F. R. Zietz).

*Diatomineura testacea*, Macquart, Dipt. Exot. i. p. 103 (1838); Walker, List Dipt. pt. v., Suppl. i. p. 145 (1854); Ricardo, Ann. & Mag. Nat. Hist. (8) xvi. p. 31 (1915).

One female from Cairns District, Queensland (Dodd).

*Diatomineura abdominalis*, ♀, sp. n.

Type (female) and another from Laurieton, New South Wales, 19.10.15.

A species nearly allied to *Diatomineura brevirostris*, but distinguished from it by the absence of any white or yellow haired spots on abdomen and by the first posterior cell being considerably narrowed at the border, only half open.

Length 15 mm.

*Face, palpi*, and *antennæ* as in *D. brevirostris*. *Forehead* parallel, also the same; the frontal callus when not denuded appears to be small, pear-shaped. *Thorax* dresden-brown, with short black pubescence, no stripes are visible; shoulders with chiefly yellowish-white hairs continued on sides of thorax as far as the scutellum, but they do not quite reach the apex of scutellum; a faint white spot is visible on each side of thorax near the suture, on the dorsum. *Abdomen* amber-brown, mottled with blackish markings, smooth, shining, with very short black pubescence; sides with yellowish-white hairs; apex and sides of posterior segments paler in colour; underside paler with black spots. *Legs* reddish-yellow; the tarsi brownish, pubescence chiefly black. *Wings* clear, stigma yellowish, veins brown, no appendix; first posterior cell narrow at border, but open.

*Erephopsis maculipennis*, Macquart, Dipt. Exot., Suppl. iv. p. 20 (1849); Schiner, Reise Novara, Dipt. p. 99 (1868) [*Pangonia*]; Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 106 (1900); id. (8) xvi. p. 23 (1915).

A series of specimens from South Australia appear to be this species, judging from Macquart's description, though there are a few discrepancies; his type came from the East Coast of New South Wales.

The *wings* have an appendix and two brown spots, which, however, amount to little more than dark shading on the transverse veins. *Abdomen* black, at base testaceous, with

median black spots on the first two segments. *Antennæ* red, *palpi* with the second joint a little longer than the first, which is blackish; the second one reddish, black at borders, concave and broad, ending in an obtuse point.

*Erephopsis lasiophthalma*, Boisduval, Voyage 'Astrolabe,' Zool. ii. p. 666 (1832) [*Pangonia*]; Macquart, Suites à Buffon, i. p. 193 (1834); Walker, List Dipt. Brit. Mus. v., Suppl. i. p. 139 (1854); Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 154 (1900).

The type was described from Cape Jervis, S. Australia. *Erephopsis contigua*, Wlk., is not identical as Walker stated. *Pangonia fuliginense*, Boisduval, is from New Guinea; whether it is the same as *Erephopsis lasiophthalma* is doubtful.

Three females from Mt. Kosciusko in N.E. Victoria, and two females from Moonbar, New South Wales (*Margrave*) (1915), in Brit. Mus. Coll., belong, I believe, to this species, answering to the description by Boisduval. Whether the specimens Macquart placed under this species are identical is doubtful.

The *wings* have one dark band crossing the base of the discal cell and the apices of the basal cells, and the transverse veins at fork of third vein and apex of discal cell are shaded; there is the rudiment of an appendix present; the first posterior cell is narrowed at border, but open. *Abdomen* reddish with a black median spot on the first three segments, then usually darker at the apex. *Antennæ* reddish yellow. *Palpi* same colour, very short; the second joint not much longer than the first joint, very concave. *Forehead* twice as broad anteriorly as it is at the vertex, with dark furrows above, continued to the antennæ. Walker's species has two very distinct dark bands on the wings. *E. maculipennis* differs in the wings, which are only shaded, and the first joint of palpi is dark.

*Erephopsis guttata*, Donovan, Illust. Ent. i., Hym. et Dipt. (1806) [*Tabanus*].

One female from Queensland.

*Erephopsis gibbula*, Walker, List Dipt. i. p. 140 (1848); Ricardo, Ann. & Mag. Nat. Hist. (7) v. pp. 112, 117 (1900); id. (8) xvi. p. 22 (1915).

Five females from Warren River, West Australia.

*Erephopsis aureohirta*, Ricardo, Ann. & Mag. Nat. Hist. (7) v. pp. 112, 116, pl. i. fig. 10 (1900); id. (8) xvi. p. 23 (1915).

Two females from Queensland.

*Erephopsis doddi*, ♀, sp. n.

Type (female) and others from Warren River, West Australia (*W. D. Dodd*). The type is in the South Australian Museum.

A species with shaded transverse veins on the wings. Abdomen testaceous at base with median black spots and blackish at apex and greyish or reddish segmentations. Antennæ blackish. Palpi very small, short, and concave. Legs testaceous and blackish.

Length 15 mm.

Face reddish, with grey tomentum and long black hairs, some white ones intermixed. Beard yellowish white. Palpi testaceous, the first joint with long black hairs, the second one conical and concave with curved upper border, and a few short black hairs at apex. Antennæ black, the first two joints with long black hairs. Forehead reddish brown with grey tomentose sides and with black thick pubescence, broadest anteriorly, being quite a third broader than at vertex; ocelli distinct. Thorax blackish with two narrow, grey, tomentose stripes on anterior half of dorsum only; pubescence as in *E. gemina*, Walker. Abdomen very similar to this last species, the third segment with a black spot similar to the one on the second segment; hairs on sides chiefly white, black on the third, fourth and fifth segments; underside bright testaceous with a few white hairs. Legs testaceous, but blackish on the upper sides of femora; pubescence black. Wings with the first posterior cell closed or slightly open.

*Pelecorrhynchus eristoloides*, Walker, List Dipt. Brit. Mus. i. p. 193 (1848) [*Silvius*]; Ricardo, Ann. & Mag. Nat. Hist. (7) v. p. 102 (1900); White, Royal Soc. Tasmania (1915), pt. ii., Diptera Brachycera, p. 22.

One male from Huron River, Tasmania (*Lea*).

#### Genus SILVIUS.

Mr. Taylor has lately forwarded me a copy of his paper (Proceedings Linnean Soc. of New S. Wales, 1915, vol. xl.

pt. 4, Nov. 24th), containing eight new species of this genus, which, with the four new species named by me in the Ann. & Mag. Nat. Hist. (8) xvi., Oct. 1915, brings the known species occurring in Australia to twenty. Seven new species are now added, which are all distinct from those described by Mr. Taylor, judging from his descriptions.

*Silvius grandis*, ♀, sp. n.

Type (female) and another from Fortescue River, Hammersley Range, North-West Australia, and another in the Brit. Mus. Coll. from N. Australia (*J. R. Elsey*), 57.13.4—this latter in bad preservation. The type is in the South Australian Museum.

A large dark brown species; antennæ, palpi, and legs blackish. Abdomen with white-haired segmentations.

Length 15 mm.

*Face* blackish, covered with grey tomentum and with some white hairs. *Palpi* similar to those of a species of *Tabanus*; large, black, stout at base, ending in a point. Beard scanty, white. *Antennæ* black, the third joint wide at its base, the first two joints with black hairs. *Eyes* bare. *Forehead* narrow, and narrower anteriorly than at vertex; frontal callus narrow, pear-shaped, with long lineal extension; ocelli distinct; traces of golden-coloured pubescence on forehead. *Thorax* (denuded) blackish brown, some white hairs at sides and on shoulders. *Abdomen* blackish brown, the segmentations white-haired, the other female has the first and second segments partly yellowish brown; traces of grey tomentum appear on segments; pubescence on abdomen black; underside blackish, with white-haired segmentations. *Legs* blackish brown with black pubescence, the tibiæ more reddish brown. *Wings* greyish, slightly tinged yellowish brown; veins and stigma yellowish; no appendix.

*Silvius fuscipennis*, ♀, sp. n.

Type (male) from Claudie River, Queensland (*T. A. R.*).

Type (female) from Cape York, N. Queensland (*Macgillivray*).

Three females from Claudie River and one female from Cape York.

The types are in the Nat. Museum, Victoria.

A species apparently belonging to this genus, to be recognized at once by the brown wings with one irregular clear band and two clear spots.

Length 13–16 mm.



*Female*.—*Face* covered with yellowish-grey tomentum and with a few white hairs. *Beard* white. *Palpi* fairly stout, reddish yellow or darker in colour. *Antennæ* blackish, the first two joints rather large with black hairs, the third broad at its base. *Eyes* bare. *Forehead* narrow, but a little wider anteriorly, the frontal callus black, club-shaped, with an extension not reaching the vertex; forehead blackish with yellowish-grey tomentum. *Thorax* and *scutellum* blackish brown. *Abdomen* broad, blackish with narrow reddish-yellow bands; underside the same, but more reddish brown. *Legs* blackish. *Wings* sepia, the pale irregular band crosses the bases of the first submarginal, the first posterior, the discal, the fourth and fifth posterior cells; there is a small clear spot at the base of the fork of the third longitudinal vein, and a larger one on the apex of the discal cell, embracing the base of the second and third posterior cells; stigma dark brown; wing at base somewhat pallid.

In the female from Claudie River the palpi are blackish, the abdomen on the first four segments is yellowish with a black spot in the centre of each segment, the remaining segments blackish with yellow segmentations; underside yellowish with broad whitish segmentations, darker at apex.

*Male* somewhat different from the female in the colouring of the *abdomen*, which has black spots in the centre of each of the first three segments, and the apical segments are entirely black; pubescence on the yellow parts yellow, black elsewhere; underside identical. Sides of *thorax* with bright reddish-yellow hairs, dorsum deep black. *Scutellum* the same, with black hairs. *Wings* paler brown than in the female.

*Silvius nigripennis*, ♀, sp. n.

Type (female) and another female from Claudie River, North Queensland (*J. A. Kershaw*), 11/12 and 2/13. One female from same place, 28.1.14.

The type is in the National Museum, Victoria.

A species rather *Tabanus*-like in appearance, and very similar to *Silvius grandis*, sp. n., in all particulars, except the wings; easily distinguished by its almost wholly brown wings and black abdomen with white bands.

Length, type,  $16\frac{1}{2}$  mm., the others 14 and 17 mm.

*Face* flat in centre, covered with grey tomentum and with white pubescence. *Palpi* black, rather stout on their whole length, ending in a short point. *Antennæ* black, broad at base of third joint, *Tabanus*-like in shape. *Forehead* slightly

broadly anteriorly, about four times as long as it is broad, covered with grey tomentum; frontal callus brown, pear-shaped, with short lineal extension; pubescence scanty, white; ocelli distinct. *Thorax* blackish, covered with grey tomentum; pubescence black, with some appressed white hairs. *Scutellum* same colour. *Abdomen* black with black pubescence; bands of white hairs on posterior borders of the first four segments, not reaching the middle of segment; underside black with three complete white bands. *Legs* black with black pubescence. *Wings* dark brown, pale at the extreme apex, with a clear streak below the stigma, and the extreme edge of the posterior border of wing also pale.

*Silvius fergusonii*, ♀, sp. n.

Type (female) from Nelson Island, Hawkesbury River, New South Wales, 26.2.16.

This handsome species, named after the donor, is nearly allied to *Silvius nigripennis*, sp. n., from the northern part of Australia; but is distinguished by the pale base of wing. These two species, together with *Silvius grandis*, sp. n., form a group unlike the typical forms by their larger size and dark abdomens marked with paler segmentations, and by their coloured wings.

This species measures 17 mm.

*Face* covered with light ashy-grey tomentum and with some silvery-white hairs in centre of face, and longer, more numerous ones in the furrows between the face and the cheeks, joining the beard of same colour. *Palpi* blackish, with some ashy-grey tomentum, and short dark hairs; they are large and stout with an obtuse point. *Antennæ* black, the first two joints with black hairs, the third large and wide at the base with a distinct angle. Subcallus same colour as face. *Forehead* same colour, narrow, parallel, about six times as long as it is broad anteriorly; the frontal callus black, shining, not reaching the eyes, pear-shaped, with a long stout lineal extension reaching the ocelli. *Thorax* blackish brown, somewhat shining, with two grey tomentose stripes and grey at sides; pubescence chiefly black; some white hairs on the stripes; pubescence on shoulders long, black, with tufts of white hairs at base of wings. *Scutellum* the same colour. *Abdomen* blackish brown, the first two segments with broad grey tomentose bands, which are represented on the remaining segments only at the sides; these bands have white hairs, thickest at

the sides, pubescence elsewhere black; underside is identical, but the grey bands are present on every segment for their whole width. *Legs* black, the fore coxæ with whitish tomentum and pubescence. *Wings* blackish brown, darkest on the fore border in the submarginal cells, becoming paler at apex and on posterior border, and almost clear in the basal, anal, and axillary cells; stigma blackish; veins brown.

It is distinguished from *Silvius nigripennis* by the pale base of wing, and by the shape of the frontal callus and forehead.

*Silvius niger*, ♀, sp. n.

Type (female) from Heleusburgh, New South Wales, 9.3.15. Was resting on branch of low shrub; when disturbed it circled round my head, evidently seeking to bite (*E. W. F.*).

A small robust black species, with a broad abdomen and clear wings. Eyes slightly pubescent. Antennæ and palpi dull reddish yellow. Legs blackish.

Length 11 mm.

*Face* covered with brownish tomentum, paler on cheeks, and with some dark hairs in the centre; on the cheeks they are much thicker and long, increasing in length as they attain the bases of cheeks. Beard same colour. *Palpi* reddish yellow, curved on their upper edges, which are clothed with a distinct fringe of black hairs, the lower edges have a similar fringe; they are somewhat stout at base, ending in an obtuse point. *Antennæ* rather a darker shade than the palpi, the first two joints with black hairs, the third joint with a very few at the base and on the extreme tip; the tooth represented by an obtuse angle. *Forehead* same colour as face, with black pubescence, parallel; the frontal callus dark brown, very narrow, keel-like. Ocelli very distinct. *Thorax* sepia, with two broad grey tomentose stripes and grey sides; a few scattered white hairs on dorsum; long black hairs on the grey tomentose shoulders. *Scutellum* a little darker. *Abdomen* blackish, grey tomentum on the first segment; on the second, third, and fourth segments appear short white hairs on the sides and in the middle, not, however, joining each other to form a band; pubescence elsewhere black; segmentations with traces of grey tomentum; underside black with very narrow white-haired segmentations. *Legs* black; knees reddish yellow, the tibiæ obscurely so; pubescence black. *Wings* clear, veins yellowish brown, stigma yellowish.

*Silvius montanus*, ♀, sp. n.

Type (female) and another from Mt. Tambourine, Queensland (*A. M. Lea*).

The type is in the South Australian Museum.

A blackish-brown species with yellowish segmentations on abdomen and traces of median yellow spots. Antennæ reddish yellow. Legs blackish brown, some of the tibiæ yellowish.

Length 10 mm.

*Face* covered with greyish tomentum and with yellowish tomentum near the eyes; pubescence consists of long blackish hairs. Beard whitish. *Palpi* stout, covered with grey tomentum and with black pubescence, yellowish at extreme base. *Antennæ* with the first joint greyish, covered with black hairs, the second yellow with black hairs, the third reddish brown, apex black. *Forehead* broader anteriorly, covered with yellowish-brown tomentum, brown in the centre; the frontal callus elongate, apparently broader near the vertex; forehead covered with black hairs; ocelli distinct. *Eyes* bare. *Thorax* reddish brown with two grey stripes, most distinct anteriorly, covered with greyish-yellow hairs and with black pubescence intermixed, and longer black hairs at sides. *Scutellum* brown, with black hairs. *Abdomen* brown; the segmentations widely pale yellow, with white hairs, which form median spots; pubescence black; hairs at sides chiefly white; underside blackish, with white-haired bands. *Legs* blackish, the fore and mid tibiæ obscurely yellowish, the hind tibiæ reddish brown; pubescence on legs black. *Wings* greyish, the transverse veins shaded, the other ones faintly shaded; no appendix; stigma yellowish; veins brown.

*Silvius insularis*, ♀, sp. n.

Type (female) and another from Bathurst Island, N. Territory.

The type is in the South Australian Museum.

A small narrow blackish-brown species, with a greyish tomentose stripe on abdomen; legs pale yellow, the femora darker. *Palpi* long, narrow, with truncated tips.

Length 10 mm.

*Face* reddish, covered with grey tomentum, and with some short white hairs. *Palpi* yellowish, with black hairs. *Antennæ* yellowish, the first two joints with black hairs, the third wide at its base. *Forehead* almost parallel; frontal

callus blackish, quadrate, reaching the eyes, with a lineal extension, covered with grey tomentum. Ocelli distinct. *Thorax* and *scutellum* reddish brown, with white short pubescence and some grey tomentum anteriorly on thorax. *Abdomen* blackish brown, with a broad median stripe of grey tomentum and grey segmentations, and scattered white hairs on stripe and segmentations; underside dark, with grey segmentations. *Legs* with some brown colour on the femora and on apices of tibiæ and tarsi; pubescence white, with some black on tibiæ and tarsi. *Wings* clear, veins yellowish.

*Silvius indistinctus*, Ricardo, Ann. & Mag. Nat. Hist. (8) xvi. p. 262 (1915).

Two females from Melville Island, N. Australia (*W. D. Dodd*).

Five females from Bathurst Island, Northern Territory.

One female from Coen River, Cape York Peninsula, N. Australia (*W. D. Dodd*).

*Ectenopsis australis*, ♂ ♀, sp. n.

Male (type) from Milson Island, Hawkesbury River. This type is not in the Brit. Mus. Coll.

Female (type) from Sydney (*C. Gibbons*), 16. 12. 14.

A species nearly allied to *Ectenopsis vulpecula*, Wied., but distinguished from it by the very distinct stripes on thorax and by the darker, not uniform, colour of abdomen and of the face. The legs, which, however, appear to be variable in colouring in the typical species, are here reddish yellow; the tarsi dusky.

*Female*.—*Face* and *forehead* chamois-coloured, with some grey tomentum. *Antennæ* with the first two joints pale reddish yellow with black hairs, the third joint with the first division raw-sienna in colour, the next two divisions dusky with grey tomentum, and the remainder blackish. *Thorax* covered with yellowish-grey tomentum, with a narrow median brown mahogany stripe, becoming broader beyond the suture, and a broad one of the same colour at each side. *Scutellum* uniform brown mahogany-colour. *Abdomen* the same colour, with paler grey tomentose segmentations, developing on the second, third, and fourth segments into triangular median spots; underside almost a uniform paler shade. Appendix of wing long.

The *male* is similar, but the triangular median pale spots

of abdomen are absent. *Legs* duskier. The following note on the eyes of the male is furnished by the collector:—"Eyes brilliant green, with reddish-brown lines across at lower third; lines sharply defined below, fading above; similar line round whole eye. Eyes appear reddish brown in some lights."

#### TABANUS.

#### Group IV.

*Tabanus angusticallus*, ♀, sp. n.

Type (female) and another from Melville Island, N. Australia (*W. D. Dodd*). The type is in the South Australian Museum.

A small greyish-brown species, which may be included in Group IV., as the frontal callus is only represented by a very small black line. *Antennæ* and legs reddish yellow.

Length  $7\frac{1}{2}$  mm. (type); the other female  $9\frac{1}{2}$  mm.

*Face* and *forehead* covered with yellowish-grey tomentum; pubescence on face consists of a few white hairs and longer brown hairs below and on cheeks. *Palpi* long and narrow, hardly incrassate at base, yellow, with short black pubescence. Beard consists of white hairs below and brown above. *Antennæ* bright red-yellow, the two first joints pale yellow with black hairs, the third joint very broad at base, with a few black hairs at angle. *Forehead* parallel, about five times as long as it is broad, with some black pubescence. *Eyes* bare. *Thorax*, *scutellum*, and *abdomen* the same colour, blackish brown, with grey tomentum, and with short black pubescence; a few yellowish hairs at base of thorax, segmentations of abdomen narrowly pale; underside with wider yellow segmentations and white pubescence. *Legs* yellow, with black pubescence. *Wings* clear, grey; veins and stigma very pale yellow; long appendix present.

*Tabanus nemotubercylatus*, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 388 (1915).

Three females from Cape York.

One female from Claudie River, N. Queensland.

*Tabanus nemopunctatus*, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 388 (1915).

A series of females from Ycelanna, S. Australia, appear

to belong to this species, though the type came from Queensland. These females have a broader forehead, wider anteriorly, whereas in the type it is parallel.

#### Group VII.

*Tabanus stranymanni*, ♂, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 393 (1914).

One male from Cairns District (*W. D. Dodd*).

*Tabanus rufinotatus*, Bigot, Mém. Soc. Zool. de France, v. p. 673 (1892) (*Atylotus*); Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 392 (1914).

A series of females from Melville Island, N. Territory.

*Tabanus pseudoardens*, Taylor, Austr. Inst. Trop. Med. 1911, p. 66, pl. xiv. fig. 18 (1913); Austen, Ann. & Mag. Nat. Hist. (8) xiii. p. 265 (1914); Ricardo, *ibid.* (8) xiv. p. 272 (1915).

A series of females from Cairns District, Queensland.

#### Group VIII.

*Tabanus victoriensis*, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 275 (1915).

Females from Mt. Tambourine, S. Queensland.

#### Group IX.

*Tabanus macquarti*, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 277 (1915). [*Tabanus limbatinervis*, Macq. Dipt. Exot., Suppl. iv. p. 333 (1852).]

A series of females from Cairns District, Queensland.

*Tabanus neogermanicus*, Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 283 (1915).

A series of females from Melville Island, S. Queensland.

*Tabanus clavicallosus*, ♀, sp. n.

Type (female) from Milson Island, New South Wales, 10.1.15; other females from the same locality, and one female from Sydney. ("Eyes of a dull brown colour when alive": note by collector.)

The type is in the South Australian Museum.

A small species allied to *Tabanus neogermanicus*, Ricardo, but differing in the darker colour of the abdomen, and in the shape of the frontal callus which is rather distinctive for this species.

Length 11–12 mm.

*Face* covered with yellowish-grey tomentum, almost devoid of pubescence. Beard composed of sparse white hairs. *Palpi* long and slender, pale yellow, a little stouter on the basal half, ending in a long point; pubescence on the first long, white, on the second joint short and black. *Antennæ* bright reddish yellow, dusky at the tips, the first two joints with black pubescence, the third not very wide at its base, with a slight tooth. *Forehead* and subcallus darker than the face, the latter often appearing reddish through the tomentum; the forehead with black short hairs beyond the frontal callus, which is blackish brown, not reaching the eyes; large and club-shaped, ending in a very short point, which is, however, drawn out on some of the specimens; the whole callus is long, often attaining half the length of the forehead, which is about four times as long as it is broad and is the same width throughout. *Thorax* blackish, covered with yellowish-grey tomentum and with appressed pale fulvous hairs; pubescence on the reddish shoulders black, some white hairs at sides at base of wings. *Scutellum* identical. *Abdomen* blackish brown; posterior halves of the segments with greyish tomentose bands, extending in the middle as indistinct median spots, most discernible on the second to the fifth segments; some very short white pubescence is present on the segmentations and is longer at the sides. *Legs* blackish; the femora with some grey tomentum, and at their apices reddish yellow, or almost wholly so; the tibiæ reddish yellow, dusky at their apices. *Wings* clear, stigma yellowish brown, veins brown; a short appendix present.

Dr. Ferguson states that this is a common species.

*Tabanus milsonis*, ♀, sp. n.

Type (female) and another from Milson Island, New South Wales. ("Occurs on the cattle, but is rare and hard to catch": note by collector.)

A medium-sized species, blackish brown, with yellow palpi and blackish antennæ. Legs dusky in colouring. Abdomen with grey tomentose bands and spots. Wings with an appendix.



Length 16 mm.

Face covered with pale tomentum and some white short hairs. Beard white. *Palpi* pale yellow, swollen on their basal half, ending in a point which is about equal in length to the basal half, some grey tomentum on this latter; pubescence black, white below. *Antennæ* blackish, the first two joints reddish, the third joint broad at its base. *Forehead* parallel, about five times as long as it is broad; the frontal callus chestnut-coloured, oblong, not reaching the eyes, with a lineal extension; forehead darker than face, with black hairs. *Thorax* blackish brown, with two narrow grey tomentose stripes and grey at the sides. *Scutellum* identical. *Abdomen* blackish brown with broad grey tomentose bands, extending into blunt triangular spots in the middle; the ground-colour under the tomentum often appears reddish, and the sides are reddish yellow; pubescence on segmentations white, and on sides, elsewhere black mixed with the white at sides, and rather long and abundant at sides; underside reddish brown with grey tomentum. *Legs* dusky in appearance, the femora with grey tomentum, the tibiæ obscurely reddish; pubescence chiefly black, some white hairs on the femora and long ones on their under sides. *Wings* large, clear; veins blackish brown, with an appendix; stigma yellowish.

#### Group X.

*Tabanus nigratarsis*, Taylor, Report Austr. Inst. Tropical Medicine, 1911, p. 18 (1913); Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 288 (1915).

Two females from Northern Territory.

*Tabanus sanguinarius*, Bigot, Mém. Soc. Zool. de France, v. p. 675 (1892) [*Atylotus*]; Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 287 (1915).

Series of females from Mt. Tambourine, S. Queensland.

*Tabanus kershawi*, ♀, sp. n.

Type (female) and another from Claudie River, N. Queensland (*J. A. Kershaw*), 11/12 and 13. 2. 14.

The type is in the National Museum, Victoria.

A small black species, at once distinguished by the pale tibiæ and the reddish-yellow antennæ.

Length 10 mm.

*Face* black, with some brown tomentum and black hairs. *Palpi* blackish, very stout, ending in a very short point; pubescence black. Beard black. *Antennæ* reddish yellow, with a very small angle on the third joint; some black hairs on the first two joints. Subcallus shining black. *Forehead* a third narrower anteriorly, about eight times as long as it is broad anteriorly, covered with grey and brown tomentum; frontal callus small, oblong, reaching the eyes, with a lineal extension. *Eyes* bare, with traces of three stripes. *Thorax, scutellum, and abdomen* blackish with some few appressed grey hairs on thorax and scutellum, and on segmentations of abdomen; pubescence at sides black. *Legs* black, the fore tibiæ whitish, darker at extreme apex, the middle tibiæ and the hind pair wholly whitish; fore tarsi black, the others almost wholly whitish. *Wings* clear, veins and stigma yellow; no appendix.

## Group XI.

### Subgenus THERIOFLECTES.

Species with pubescence on the eyes.

*Tabanus regis georgii*, Macquart, Dipt. Exot. i. p. 132 (1838); Ricardo, Ann. & Mag. Nat. Hist. (8) xvi. p. 276 (1915).

One female from S. Australia (*Rev. A. P. Burgess*). ("Eyes in this species are dull-coloured": note by the collector.)

*Tabanus circumdatus*, Walker, List Dipt. i. p. 185 (1848); Ricardo, Ann. & Mag. Nat. Hist. (8) xiv. p. 280 (1915); White, Royal Soc. Tasmania, 1915, pt. ii. p. 14.

(*Tabanus nepos*, Wlk.; *abstersus*, Wlk.; *brevidentatus*, Macq.; and *hebes*, Wlk., are all synonyms of this species.)

A series of females from Yeelanna, S. Australia, and from Swansea, Tasmania.

*Tabanus cirrus*, ♀, sp. n.

Female (type) from Milson Island, Hawkesbury River, New South Wales.

A stout, medium-sized, black species, distinguished by the

tufts of white hairs on the thorax at base of wing and by the white-haired fringe of scutellum.

Length 15 mm.

Face covered with ashy-grey tomentum and in the centre with long, fairly dense, white hairs. Beard white. *Palpi* yellowish with grey tomentum, stout at base, ending in a rather short point; the pubescence scanty, chiefly pale. *Antennæ* dusky, the first two joints with black hairs. *Eyes* very distinctly pubescent. *Forehead* broad, about three times as long as it is broad anteriorly, where it is distinctly wider than at vertex; forehead and subcallus a little darker than face; frontal callus bare, protuberant, almost reaching the eyes, pear-shaped, with a short lineal extension, pitchy-brown in colour; pubescence on forehead black. *Thorax* blackish brown, with two grey tomentose stripes and another on each side below the suture; shoulders reddish with black hairs; a tuft of white hairs below base of wings, and another continued to the scutellum; pubescence on dorsum black. *Scutellum* blackish brown, fringed with white hairs on its posterior border. *Abdomen* blackish brown, with broad greyish-white tomentose segmentations and traces of white hairs on them, which are distinct on the side edges of the segments; pubescence elsewhere on dorsum black. *Legs* black, the fore coxæ covered with ashy-grey tomentum and with white hairs; the tibiæ reddish yellow, black at their apices; femora and tibiæ with chiefly white pubescence. *Wings* clear, veins blackish; an appendix present; stigma brownish.

*Tabanus neocirrus*, ♀, sp. n.

Type (female) from Swansea, Tasmania (*Lea*), and another female from S. Australia.

The type is in the South Australian Museum.

A black species with whitish spots and segmentations on the abdomen; smaller than *Tabanus cirrus*, sp. n.

Length, type, 12 mm.; the other female 10 mm.

It differs from *Tabanus cirrus* in the following particulars:—*Palpi* slender, the long point nearly as long as the slightly incrassate basal part, covered with white pubescence. Third joint of *antennæ* broad at base. Pubescence on thorax black with many white hairs, which are long anteriorly and shorter posteriorly. *Abdomen* with a distinct stripe composed of white-haired median spots; segmentations also white-haired, thickest at the sides.

*Tabanus postponens*, Walker, List Dipt. i. p. 179 (1848);  
Ricardo, Ann. & Mag. Nat. Hist. (8) xvi. p. 282  
(1915).

Males and females from South Australia.

The femora are sometimes dark.

*Tabanus pacificus*, ♀, sp. n.

Type (female) and another female from Suva, Fiji Islands, 30. vi. 1910 and xii. 1910 (*Dr. P. H. Bahr*). Presented by London School Tropical Medicine.

For list of species from these islands and surrounding region, see Ricardo, Ann. & Mag. Nat. Hist. (8) xiii. p. 476 (1914).

A narrow-bodied dull-coloured species; palpi slender, blackish. Antennæ dull reddish yellow. Forehead narrow. Legs dull yellowish and brown.

Length 12 mm.

Face covered with tawny tomentum. Beard scanty, brownish. Palpi long and slender, almost the same width throughout; blackish with some greyish tomentum and a few black hairs. Antennæ tawny, the first two joints yellowish with black hairs, the third joint with a small but distinct tooth on its first division at base, clothed at tip with some black hairs; the next three divisions are equal in length, yellowish, the last one dusky and nearly as long as the three preceding ones together. Forehead narrow, slightly narrower anteriorly, about six times as long as it is broad anteriorly; frontal callus shining dark chestnut-brown, oblong, reaching the eyes, with a long, stout, lineal extension reaching nearly to the vertex. Thorax mummy-brown, with some traces of grey tomentum and some yellowish short hairs, but chiefly black ones, on the dorsum. Scutellum the same colour with black pubescence. Abdomen mummy-brown, appearing darker by reason of the rather thick, short, black pubescence; there are small, whitish, yellow-haired, median spots on each segment except the last two, and indistinct, narrow, grey segmentations, not visible on the apical segments, and almost absent on the other female; underside with white-haired segmentations and no spots. Legs mummy-brown, the femora yellowish, pubescence on legs black. Wings grey, faintly tinged brown on fore-border and on cross-veins; stigma and veins brown; appendix present, but very short.

XVI.—New Species of *Hæmatopota* from India.

By GERTRUDE RICARDO.

THESE species were handed to me for identification by the Imperial Bureau of Economic Entomology, the types to be given to the British Museum Collection.

*Hæmatopota montanus*, ♀, sp. n.

Type (female) and another from Bababuddin Hills, Mysore, 4700 ft., vi. 1915 (Ramakreshna Coll.).

A small species allied to *Hematopota latifascia*, Ricardo ('Records Indian Museum,' iv. p. 355, 1911), having one broad band extending across the apex of wing, but distinguished from it by the absence of a black band on the face.

Length of type 8 mm.; the other female 10 mm.

*Face* covered with grey tomentum and with small dark brown spots on the upper part, in the other female there is a trace of a black band on the lower edge; there is also a dark spot between the antennæ; hairs on face scanty, white. *Palpi* pale yellow with black hairs. *Antennæ* long and slender; the first joint as long as the first annulation of the third joint, only slightly incrassate, yellow with black pubescence; the second one very small, blackish; the third yellowish at base, then dusky; slender throughout. *Fore-head* same colour as face; the frontal callus blackish brown, reaching the eyes, straight on both borders; the paired spots the same colour, touching the eyes, but not the band; some black pubescence on forehead. *Thorax* yellowish brown with appressed yellow hairs and some black ones; *scutellum* same colour with black hairs. *Abdomen* mummy-brown, with pale yellow segmentations and an obscure pale median stripe; pubescence black, some yellow hairs at apex; under-side paler. *Legs* yellowish with blackish-brown rings; fore femora rather dusky and the others dusky at their apices; tibiæ at base and apex blackish and a black ring in middle, the fore tibiæ white at base, fore tarsi wholly black, on the other tarsi the basal joint is pale yellow; pubescence on dark parts black, on the pale parts white; fore tibiæ incrassate. *Wings* with the usual rosettes; the apical band starts from the junction of the first vein with the border and attains the posterior border, it is rather sinuous on both borders; on the posterior border pale spots are present in every cell; veins and stigma brown.

*Hæmatopota hindostani*, ♀, sp. n.

Type (female) and two other females from Bababuddin Hills, Mysore, 4700 ft., vi. 1915 (Ramakrishna Coll.).

A species in the same group as *H. montanus*, sp. n., but rather allied to *H. assamensis* in the wing having a single band at apex, not reaching the border; face with a black band; palpi rather stout and short, pubescence on them and on face rather thick.

Length 8 mm.

*Face* covered with grey tomentum and with some white hairs, and a black band on upper part of face. *Palpi* covered with grey tomentum and with thick black pubescence; some white hairs on the first joint below. *Antennæ* dull reddish, the third joint dusky at apex, the first joint rather stout, shining, with black hairs, the second one very small, same colour, the third a little broader at base, the first joint longer than the first annulation of third joint. *Forehead* black, covered with brownish tomentum. *Frontal callus* black, shining, reaching the eyes, with a straight border and a black spot between the antennæ. *Thorax* mummy-brown, with three pale stripes anteriorly, the side ones ending in a pale spot at the suture and there is another pale stripe posteriorly at the sides; pubescence chiefly consists of pale appressed hairs; scutellum same as thorax. *Aldomen* same colour as thorax, with pale yellow segmentations and a pale median stripe; pubescence almost nil; underside yellowish. *Legs* yellowish with darker rings; apices of femora and the tarsi dark. *Wings* with the usual rosettes, the apical band short, not reaching far beyond the fork of third vein; sometimes a pale spot is visible on border, but never joining the band; veins and stigma brown.

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XVII.—*The Fishes of the Genus Clupea.*

By C. TATE REGAN, M.A.

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IN a preliminary arrangement of the Clupeoid fishes in the collection of the Natural History Museum, I had put together examples of *Clupea arcuata*, Jenyns, and specimens received from New Zealand as *Clupea antipodum*, Hector, as belonging to a genus distinct from *Clupea*; on going through

the material a second time I find that such a genus cannot be maintained, and that *Clupea* must be enlarged by the addition of *C. arcuata* and the closely related *C. melanostoma* as well as by the species generally known as *C. antipodum*, but here called *C. muelleri*, Klunz., since reference to the original description shows that the name *C. antipodum* should be given to the species recently described by me as *C. holodon*. The synopsis given in my former paper (Ann. & Mag. Nat. Hist. (8) xviii. 1916, p. 3) may be modified to include the three additional species.

- I. Pelvic fins 9- (rarely 8- or 10-) rayed; vomer toothed. D. 17-20.  
 A. 14-20. Vertebrae 50-59. 40 to 51 gill-rakers on lower part of anterior arch. (Northern species.)  
 Ventral scutes all keeled ..... 1. *harengus*.  
 Ventral scutes in front of pelvic fins not keeled .. 2. *pallasii*.  
 II. Pelvic fins 8-rayed. D. 15-19. A. 17-21. Vertebrae 42-51.  
 35 to 40 gill-rakers on lower part of anterior arch. (Southern species.)  
 A. Vomer toothed.  
 Depth of body  $4\frac{1}{4}$  in length. Scales 48/13-14. .... 3. *antipodum*.  
 Depth of body 3 to  $3\frac{1}{2}$  in length. Scales 43-44/10-11. 4. *muelleri*.  
 B. Vomer toothless.  
 Vertebrae 49-51 ..... 5. *fuegensis*.  
 Vertebrae 46 ..... 6. *bassensis*.  
 III. Pelvic fins 7-rayed; vomer toothless.  
 A. 34 to 40 gill-rakers on lower part of anterior arch.  
 A 17-21. Scales 44-50/12-15 ..... 7. *sprattus*.  
 B. 25 to 30 gill-rakers on lower part of anterior arch.  
 A 22-23. Scales 42/15. Depth 3 to  $3\frac{1}{2}$  in length. 8. *arcuata*.  
 A 17-20. Scales 42/11-12. Depth  $3\frac{1}{3}$  to 4 in length ..... 9. *melanostoma*.

Descriptions of *C. antipodum*, *C. muelleri*, *C. arcuata*, and *C. melanostoma* follow.

### *Clupea antipodum*.

*Clupea sprattus*, var. *antipodum*, Hector, Edible Fish. N. Zealand, p. 133 (1872).

*Clupea holodon*, Regan, Ann. & Mag. Nat. Hist. (8) xviii. 1916, p. 5.

An elongate-ovate patch of teeth on vomer, a broad-ovate patch on tongue. Depth of body  $4\frac{1}{4}$  in the length, length of head 4 to  $4\frac{1}{3}$ . Diameter of eye 4 in length of head; maxillary extending to below anterior part of eye; 36 gill-rakers on lower part of anterior arch. Numerous radiating grooves at free margin of scales; 48 scales in a longitudinal series; 13 or 14 in a transverse series; ventral scutes keeled and pointed, 21+12. Dorsal 16-17; origin a little nearer to base of caudal than to end of snout. Anal 16-18.

Pelvics 8-rayed, inserted below origin of dorsal. Caudal peduncle longer than deep. Vertebrae probably not fewer than 46.

Stewart Island.

The type, from the Foveaux Straits, was 150 mm. long; the specimen in the British Museum measures 122 mm. in total length.

*Clupea muelleri*.

*Clupea muelleri*, Klunzinger, Sitzungsab. Akad. Wien, lxxx. 1880, p. 416.

An elongate patch of teeth on vomer, an ovate patch on tongue. Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$  to  $3\frac{2}{3}$ . Diameter of eye  $3\frac{1}{3}$  in length of head; maxillary extending to below anterior part or middle of eye; 36 to 39 gill-rakers on lower part of anterior arch. No radiating grooves at free margin of scales; 43 or 44 scales in a longitudinal series, 10 or 11 in a transverse series; ventral scutes strongly keeled and acutely pointed, 19-20+9-11. Dorsal 15-16; origin nearer to base of caudal than to end of snout. Anal 16-18. Pelvics 8-rayed, inserted below or a little in advance of origin of dorsal. Caudal peduncle deeper than long. Vertebrae 42.

New Zealand.

Five specimens, 90 to 100 mm. in total length, from Otago and Canterbury, received from the Otago and Canterbury Museums as examples of *C. antipodum*.

*Clupea arcuata*.

*Clupea arcuata*, Jenyns, Zool. 'Beagle,' Fish. p. 134 (1842); Günth, Cat. Fish. vii. p. 442.

A narrow strip of teeth on tongue; palate toothless. Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head 4 to  $4\frac{1}{2}$ . Diameter of eye 3 to  $3\frac{1}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; 28 gill-rakers on lower part of anterior arch. No grooves at free margin of scales; about 42 scales in a longitudinal and 15 in a transverse series; ventral scutes strongly keeled and acutely pointed, 18-19+9-10. Dorsal 16-18; origin nearer to base of caudal than to end of snout. Anal 22-23. Pelvics 7-rayed, inserted below or a little in advance of origin of dorsal.

Uruguay to Northern Palagonia.



Five examples, 60 to 90 mm. long, three from Montevideo, and two, from Bahia Blanca, types of the species, kindly lent to me for examination by Mr. C. Forster Cooper.

*Clupea melanostoma*.

*Pomotobus melanostomus*, Eigenmann, Proc. Washington Acad. viii. 1907, p. 452, pl. xxiii. fig. 6.

Mouth toothless. Depth of body  $3\frac{1}{2}$  to 4 in the length, length of head  $4\frac{1}{2}$  to 5. Diameter of eye 3 to  $3\frac{1}{2}$  in length of head; maxillary extending to below anterior margin or anterior  $\frac{1}{4}$  of eye; 25 gill-rakers on lower part of anterior arch. No grooves at free margin of scales; about 42 scales in a longitudinal and 11 or 12 in a transverse series; ventral scutes strongly keeled and acutely pointed, 17-20+9-10. Dorsal 15-16; origin nearer to base of caudal than to end of snout. Anal 17-20. Pelvics 7-rayed, inserted in advance of origin of dorsal. Vertebrae 43.

Rio de la Plata.

Eleven specimens, 65 to 80 mm. in total length.

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XVIII.—*Barnacles from the Hull of the 'Terra Nova':*  
a Note. By L. A. BORRADAILE.

WHEN the 'Terra Nova,' with the British Antarctic Expedition on board, was at Lyttelton, New Zealand, in 1910, barnacles were removed from her bottom. Some of these were included in the collection of Cirripedes taken by the Expedition, upon which I have recently reported (Brit. Antarct. ('Terra Nova') Exped. 1910, Zool. iii. p. 127, 1916). Others came into the possession of the Otago Museum, and are mentioned by Mr. Jennings in an article on the Pedunculate Cirripedia of New Zealand, published in 1915 in the 'Transactions of the New Zealand Institute' (xlvii. p. 285). Unfortunately, at the time of writing my report I had not Mr. Jennings's work before me, and there are consequently between our papers certain discrepancies. The object of the present note is to call attention to and explain these, as follows:—

1. My *Lepas affinis* is Mr. Jennings's *L. anatifera*, var. *c*. If I had seen Mr. Jennings's description of this form, I should still have thought it advisable to name it as I did, because in my view it is as nearly related to *L. hilli* as to *L. anatifera*, and all three forms are of the same rank,

whether species or varieties. *L. affinis* is undoubtedly a link between *L. anatifera* and *L. hilli*, but in the circumstances I have not proposed to reduce *L. hilli* to the rank of a variety, preferring to leave the discussion of its status till the genus is next revised as a whole.

2. In the material at Mr. Jennings's disposal were specimens of *Conchoderma virgatum* and *C. auritum* from the hull of the 'Terra Nova.' In the collection placed in my hands neither of these species was represented from that source. *C. auritum*, which was taken upon whales in New Zealand waters by the 'Terra Nova,' is also reported by Mr. Jennings from whales in the same neighbourhood.

## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

November 8th, 1916.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

The following communication was read:—

'*Aulina rotiformis*, gen. et sp. nov., *Phillipsastræa hennahi* (Lonsdale), and the Genus *Orionastræa*.' By Stanley Smith, B.A., D.Sc., F.G.S.

The primary object of the present communication is a description of a new and interesting coral genus of colonial habit, *Aulina*, obtained from the highest limestone that can be associated with the Lower Carboniferous—the Fell Top Limestone of Northumberland and its equivalent horizon in Teesdale, the Botany Beds.

Since this form has been confounded with another Carboniferous species, well known under the name of '*Phillipsastræa radiata* (S. Woodward),' it has been found advisable, in fact necessary, to extend the original scope of the paper so as to include a revision of the genus *Phillipsastræa* and a description of '*Ph. radiata*' and its allies, which I have grouped together under a new generic name, *Orionastræa*. Several type-specimens, including that of *Phillipsastræa hennahi* (the genotype of *Phillipsastræa*), are described and figured.

The new genus from the Fell Top Limestone is a very distinctive form, on account of the remarkable annular wall developed within the theca, and may prove of considerable value as a zonal index.

The corallum in this genus, as also in *Phillipsastræa* and in *Orionastræa*, represents a stage in colonial development in which the epitheca of the individual corallites has entirely disappeared, and these are consequently united by their dissepimental tissue—a type of colony to which the term 'Astræiform' may be applied.

### Diagnoses.

*Aulina rotiformis*.—The corallum is massive, and the corallites are united by their extrathecal tissue; all the septa dilate at the theca, and those of the major cycle again dilate at their axial edges, in such a manner as to fuse together, and so build a cylindrical wall or tube within the theca. The structure of the form is in most respects similar to that of *Phillipsastræa*, but it appears to carry forward the septal characters peculiar to that genus to a further stage of development.

*Phillipsastræa*.—The corallum is composite and massive; the corallites are united by their dissepiments, or are only separated by a thin epitheca; in the former case, the septa are often confluent. Major and minor septa dilate at the theca; the latter terminate there, and the major septa attenuate and advance into the intrathecal region, and there often dilate again at the axial edge. The central part of the corallite is occupied solely by tabulæ.

*Orionastræa*.—The characters of this genus are essentially those of *Lithostrotion*, but of a modified form. The corallum is composite and massive, and the corallites are either defined by a thin epitheca, or, in the more typical instances, by no epitheca at all; in this latter case the corallites are united by their dissepiments and the septa are confluent.

The distinguishing characters of the three species recognized and described are as follows:—

(1) <i>O. ensifer</i> (Edwards & Haime).	Septa not confluent.	Columella present.
(2) <i>O. phillipsi</i> (McCoy) .....	Septa confluent.	Columella present.
(3) <i>O. placenta</i> (McCoy) .....	Septa confluent.	Columella absent.

November 22nd, 1916.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

The following communication was read:—

'Characæ from the Lower Headon Beds.' By Clement Reid, F.R.S., F.L.S., F.G.S., and James Groves, F.L.S.

The investigations here recorded have been made at Hordle Cliffs (Hampshire), where the strata, below the superficial gravel, belong

entirely to the Lower Headon Beds, and consist of freshwater and brackish-water (more or less calcareous) deposits, laid down apparently in wide shallow lakes and lagoons. Such habitats are the most favourable to the growth of Characeæ, and several of the beds have yielded numerous remains of these plants.

There is a great diversity in the fruits of *Chara* found, representing evidently a number of species, belonging to several different sections or genera. With the exception of a few, which are possibly abnormal variations, the fruits can be roughly grouped under the following eight types:—

- I. Tuberculate series. (Type of *C. tuberculata* Lyell = *Kosmogyra* Stache, emend.)
  - (a) Spherical.
  - (b) Obovoid or pyriform, with distinctly prolonged base.
- II. Non-tuberculate series.
  - (c) Large spherical, diam. c. 1 mm. (type of *C. medicaginula* Brongn.).
  - (d) Large ellipsoidal (type of *C. helicteres* Brongn.).
  - (e) Medium-sized, subglobose, tapering more or less at both ends.
  - (f) Cylindric-ellipsoidal, showing more numerous striæ.
  - (g) More or less pyriform: that is, definitely tapering towards the base.
  - (h) Minute, subglobose-ovoid (long. = c. 350 to 500  $\mu$ ).

It is difficult to determine the exact number of species found, on account of the extreme variability of some of the forms, but the Authors consider that at least twelve may, for the present, be conveniently treated as distinct.

The vegetative remains are comparatively few, consisting of minute portions of stems and branchlets of different diameters, and these it is impossible at present to connect with any particular types of fruit.

Though investigations of some earlier formations have shown that there are extinct forms of Characeæ exhibiting important points of difference from their living representatives, the remarkably distinct and characteristic oogonium of five elongated spirally-twisted cells has remained constant certainly as far back as the Inferior Oolite, and it is only in earlier formations that any doubt arises as to whether bodies are or are not *Chara* fruits.

Characeæ are found in still fresh or brackish water all over the world, under widely different conditions as regards heat, etc., and may therefore be expected to occur in almost all freshwater formations. For these reasons it is suggested that the fruits of this group of plants, when more widely collected, may prove of considerable value as zonal fossils for the correlation of lacustrine deposits lying in isolated basins. Doubtless, on account of their small size, the Characeæ have in the past often been overlooked.

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XIX.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XL. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c., Gatty Marine Laboratory, University, St. Andrews.

[Plates VII.-XII.]

*On the Nervous System and other Points in the Structure of Owenia and Myriochele.*

SINCE the remarks on *Owenia* and *Myriochele* were made in the volume on the British Marine Annelids lately issued by the Ray Society, a few observations on both types were carried out, though, unfortunately, no living forms could be obtained; yet *Owenia* formerly was cast on the beach at St. Andrews in hundreds, whilst *Myriochele* is not uncommon on the west coast of Ireland, and in certain foreign localities it occurs in swarms. Such blanks, which may stretch over many years in the British area, are in the case of the fishes often regarded as evidence of serious diminution; but, so far as observed during a long period of years, neither in the case of the fishes nor in the case of the invertebrates is there much of a basis for this supposition. The two forms above mentioned are of interest especially as regards their nervous system, which differs from that in the majority of the Polychæts in having the cephalic system as well as the



nerve-trunks wholly hypodermal. The latter arrangement of the ventral cords is that characteristic of most Polychæts—yet about ten families have their great ventral nerve-trunks enclosed by the muscular tissues of the body-wall, besides the basement-layer, hypoderm, and cuticle, showing how uncertain any single factor is in the classification of this group. In the Archiannelid *Protodrilus* the nervous system agrees with that in *Owenia* and *Myriochele* in being mainly hypodermic, and in *Saccocirrus* and *Sternaspis* (though this is not a Polychæt) the cerebral ganglion is similarly situated and the ventral nerve-cord is not segmented into ganglia. They contrast thus with the Nemerteans, in which the cephalic ganglia are internal and the longitudinal cords either enveloped in the muscular walls of the body or entirely within them. It is further interesting, in comparing the Nemerteans with the Polychæts, that no Polychæt possesses the proportionally large nerve-supply to any organ—a supply, moreover, more bulky in its distribution than in its origin, and which undergoes remarkable changes of form, both in contraction and dilatation—as that of the Nemertean proboscis. Hence its lattice-like arrangement gave rise to the term “elastic layer” in the early memoirs. This feature is as noteworthy as the passage of the proboscis between the dorsal and ventral commissures of the cephalic ganglia. Some consider that this arrangement of the nerves causes it to be an organ of sensation; but it is often thrown off when brought into contact with foreign bodies, and, though renewed, its functions for the interval are in abeyance. In the Ammocharidæ under consideration what appears closely allied to nervous matter is distributed as a continuous layer beneath the hypoderm of the gullet—a condition much more primitive than the elaborate system of the Nemertean proboscis or than the proboscis of a typical Polychæt such as *Nereis*.

In glancing at the literature of the subject, it is found that the acute and accomplished Claparède, familiar as he was with the ordinary nervous system of the Polychæta, failed to find the central nervous system in *Owenia* “qu’il m’a été parfaitement impossible d’en trouver la moindre trace chez l’*Owenia fusiformis* sur les coupes d’individus conservés”\*, and he even had difficulty in discriminating the ventral cord in the fresh animal. Yet he had described and figured a similar condition to that of *Owenia* in *Telepsavus costarum*, one of the Chætopteridæ, in which the central nervous

\* Annél. Sédent. p. 129.

system forms a subhypodermic band resting on the basement-tissue, and which Claparède interpreted as a transverse commissure between the ganglia\*, yet to be considered as the representative of the cerebral ganglia, and the two eyes in *Telepsarus* rest on it. The ventral cords, moreover, show no ganglia and are wide apart. He does not allude to the minute structure of the nerve-tissue.

In 1885 von Drasche † gave a careful account, with figures, of the structure of *Owenia* "*filiformis*" as it occurred at Trieste, dealing in the first instance with the external characters, and especially the "Lippenorgan" at the oral aperture, the hypoderm and nervous system, the musculature, alimentary canal, cœlomic cavity, and long mucous glands. So far as he goes, the structure of these organs is correctly described, with accompanying figures. He could not satisfy himself as to the "nephridia" and the mode of exit of the genital products. He observed no nerve-cells in the minute structure of the central nervous system or in the ventral cord, only a fibrillar structure and Leydig's punctate substance. The ventral cord showed no ganglionic enlargements. Below the epithelium of the alimentary canal a strand similar in structure to the central system is briefly mentioned, but nothing definite is recorded concerning the nerve-supply of the internal organs nor concerning the nephridia.

In looking around for analogous relations of the central ganglia, it is found that in *Phoronis* Caldwell ‡ observed that the central nervous system remained in the epidermis, and therefore represented the primitive condition. In the adult the central system is in the form of a post-oral ring, the anus lying outside it. In *Phoronis buskii* of the 'Challenger' § the nerve-centre rests on a broad plate of basement-tissue, with the hypoderm externally extending from the nephridia forward to the centre of the whorl of tentacles on each side, and it agrees precisely in minute structure with that in *Cephalodiscus* and *Owenia*.

The central nervous system in *Cephalodiscus dodecalophus* || occupies an area of considerable proportional size at

\* Annél. Sédent, p. 127.

† 'Beiträge zur feineren Anatomie der Polychaeten,' Zweites Heft, Wien, pp. 1-22, 2 plates.

‡ Proc. Roy. Soc. vol. xxxiv. p. 372.

§ Zoology, vol. xxvii. part 75, pp. 18-21, pl. ii. figs. 1 & 2, pl. iii. figs. 1-3

|| 'Challenger,' Zoology, vol. xx. part 62, p. 23, pl. vi. fig. 3, and pl. vii. fig. 3.

the base of the plumes external to the median space, and is bounded externally by the thick coat of hypoderm and internally by the basement-layer. It extends laterally in the hypoderm along the basal region of the plumes and for some distance along the dorsal side of the buccal shield. In microscopic structure it is minutely cellular and granular, intermingled with fibres, and corresponds generally in position with that in *Owenia* and *Myriochele*.

Benham \* (1896) described the central nervous system of the "Archannelida" as in contact with the epidermis, and pointed out that in some Polychæta it holds a similar position in the epidermis; but he does not mention this condition in the Ammocharidæ, which he associates with his Spioniformia, nor in the Chætopteridæ included by Levinson and himself under the same group or suborder.

Gilson (1897-98) devoted much attention to the structure and function of the various parts of *Owenia*. Besides a careful account of the remarkable secreting glands †, which form such prominent organs, he has furnished an extended description of the "valves septales" ‡ and of "cellules musculo-glandulaires" in the body-wall §. Perhaps the most important contribution is that connected with the "valves septales," wherein he gives a systematic description of each septum, with its functions, one of the most striking being the second septum (*i. e.*, between the fourth and fifth segments), his sphincter muscle being in the position of the ordinary oblique muscle at its insertion over the nerve-cord. The muscular arrangements of this septum are specially connected with the cœlomic fluid and the branchiæ. After describing the special apertures in the septa and their mechanism, he shows that apertures at several of these connect the cœlom with the exterior; that in the sixth segment two zigzag cutaneous canals springing from funnels at the septum between the sixth and seventh segments perform the function of genital ducts, since nephridia are absent—a feature of a peculiar character in a Polychæt. In his paper on the musculo-glandular cells he states that a peritoneal membrane or cœlomic coat proper is absent in *Owenia*, thus resembling such forms as the Nematodes, Acanthocephali, many Annelids and Archannelids. The body-wall is formed by a combined musculo-glandular coat—that is, it cannot be separated into a muscular and a glandular layer. The inner

\* Camb. Nat. Hist., Worms, Rotifers, and Polyzoa, pp. 243, 255, & 325.

† 'La Cellule,' t. x. fasc. 2.

‡ *Ibid.* t. xii. fasc. 2.

§ *Ibid.* t. xiv. fasc. 2.

region of this coat secretes albuminoid substances, fat, and urinary products. As will be shown subsequently, such is a misapprehension of the structure of the peritoneal surface, probably owing to the condition of the accomplished Belgian author's material.

In connection with Gilson's opinion, for it is nothing more, that the hypodermic canals in the sixth segment are genital ducts, it is noteworthy that Arnold Watson observed the reproductive elements in *Owenia* issuing from two pores, to the right and left of the anus, a portion of the posterior end of the body projecting from the anterior aperture of the tube. Thus Gilson's theory of the advantages of the anterior opening of the hypodermic tubes (his genital ducts) lapses, were it only by the thrusting out of the much more delicate tail anteriorly.

Ogneff\* (1899), working at the Naples Station, took up the subject of Gilson's "cellules musculo-glandulaires" in *Owenia*. In his preparations he found within the muscular layer of the body-wall a protoplasmic and cellular layer which lined the cœlom. In the muscle-fibres of the longitudinal coat themselves were spindle-shaped cells with nuclei, as Schwalbe first described in the muscles of worms and lamellibranchiate mollusks, and also on the surface of the muscles in a protoplasmic layer. Over these, however, is a layer of peritoneal cells, which are cup-shaped, with rounded inner or deeper surfaces and flattened surfaces toward the cœlom, with an oval nucleus, fat, and granules like the white of egg in the protoplasm. A fine protoplasmic network stretches from these amongst the muscle-cells. He thought there were as many as fifteen to twenty peritoneal cells to one muscle-cell. He did not consider that Gilson's "muscle-gland-cells" existed in *Owenia*, the misapprehension being due to the less elaborate methods of preparation and section-making.

In 1900 a very interesting paper on *Owenia fusiformis* was communicated to the Linnean Society by Mr. Arnold Watson†, whose observations on the living animals are noteworthy. His description of the lip-organ and its functions, the occurrence of a prostomial pore, the discovery of the emission of the sexual elements through two cœlomo-ducts (anal pores), the structure and repair of the tubes, and the rearing of the ova to the *Mitraria*-stage are the chief features of this contribution to the life-history of the species.

\* Biol. Centralblatt. Bd. xix. p. 136.

† Journ. Linn. Soc. vol. xxviii. p. 259, pl. xxii.

One of the latest contributions is a histological paper on *Owenia* by Zürcher\*, who enters into the minute structure of the muscles, showing that the long spindle-shaped muscle-cells have a spiral character (formerly noted by Ogneff), which in transverse section give them a barred aspect. A circular muscular coat occurs only at the second dissepiment and forward to the branchial lobes. This also has spindle-shaped cells with nuclei. He combats Gilson's view, as Ogneff had previously done, that there is no line of demarcation between the muscular coat and the peritoneum, that the nuclei are rare in the muscular fibres and by-and-by vanish, and that it is impossible to distinguish the nuclei of the muscles and those of the gland-cells. He points out that the peritoneal nuclei are generally rounded, whereas the nuclei of the muscles are oval and flattened, with the long axis in the line of the muscle-cell. He goes somewhat fully into the histology of the circulatory system (his hæmocœl), the main trunk consisting of a dorsal vessel carrying the blood forward and a ventral trunk carrying it backward. The dorsal forms a blood-sinus round the gut to the second septum, then breaks up into a network over the canal, the trunks fusing at the first septum and sending forward a series of vessels to the branchiæ, the returning vessels uniting to form the ventral trunk below the gut. The walls of the vessels have a fine epithelial coat and a delicate circular muscular layer with minute nuclei in their spindle-shaped cells. The author also objects to Gilson's statement that no special constrictor to the alimentary canal occurs at the septa, and points out that at the third septum an efficient constrictor apparatus exists both for the canal and the blood-sinus, the muscular apparatus showing the large muscle-cells at the outer ends of the fibres. Posteriorly also the alimentary canal is moniliform from its constrictions. He is inclined to think that Drasche's bladder-like tissue on the ventral mesentery is part of the reproductive apparatus. The ampullæ on the ventral blood-vessel, which Drasche observed to be rhythmically contractile, are confined to the genital region of the body, and bear the reproductive elements on their outer surfaces, and, though they have muscular walls, Zürcher would attach more importance to their nutritive capacity. The red blood contains rounded or lenticular corpuscles with nuclei, and some corpuscles undergo mitosis. He found them in the ampullæ and less

\* *Jenaische Zeitschr. für Naturwiss.* Bd. xlv. pp. 181-220, pls. xv.-xx. (1909).

frequently in the vessels and sinuses. There is a mixture of venous and arterial blood in the branchiæ. The author does not touch on the structure of the nervous system of *Owenia*, the topography of the alimentary canal, the hypodermic canals of the sixth segment, and other features subsequently to be described, and his main points are histological. The illustrations are chiefly in outline.

No trace of a central nervous system is observed in *Owenia fusiformis* till the folds of the mouth are cut in the transverse sections\*, and the first definite appearance of a layer similar to nerve-tissue is the presence of a pale band external to the stained basement-layer of the inner border of a lateral flap of the mouth. It resembles a differentiated stripe of hypoderm from which cells and pigment are absent, but the fine striæ are continued through it to the basement-tissue, the whole being minutely fibrillar like the nerve-tissue, and generally dotted with minute granules. It fades away before reaching the free or ventral edge of the lateral flap, and disappears similarly at the dorsal edge of the fold. Then (for it is difficult to cut exactly on the same level) a corresponding band appears on the opposite labial fold. This pale belt is considered by some, *e. g.*, Zürcher, to be basement-tissue, but it seems to be somewhat different. In any case, the contrast between it and the condition, for instance, in the proboscis of the armed Nemertean with its large strands of nerves and their reticulations is marked, yet

\* Whilst many advantages are gained by the use of paraffin, celluloidine, and other substances for imbedding, the old plan of fine sections made directly from carefully prepared spirit-specimens is not without value in checking the proportional thickness of the muscular layers and other parts. Thus, in the case of *Owenia* the great thickness of the longitudinal muscles of the body-wall can only be appreciated in this way, and so with the proportional size of the mucous glands and the tough nature of the basement-layer. In such preparations more than forty years old the delicacy of the hypodermic<sup>1</sup> layer has caused most of it to be removed in the manipulations before and after preservation, but in every case the nerve-cord firmly adheres to the basement-tissue in the mid-ventral line, thus demonstrating its comparatively tough nature in contrast with the hypoderm. In such sections the gut fills the entire area, with the exception of the mucous glands, though, of course, in life the coelomic space was larger. The term hypoderm in the structure of the Polychæta refers to the glandular and granular layer, often areolated, beneath the cuticle. It is an ectodermic structure.

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<sup>1</sup> I am indebted to Mr. E. W. Shann, B.Sc., now Captain in the Northumberland Fusiliers, Mr. J. W. Pryde, M.A., now Lieutenant in the Black Watch, and to Miss Harvey, of Edinburgh, for aid in making the various sections.

the functions of both are equally well performed. The Nemertean brain, as in many Polychæts, is distinctly isolated from the tissues outside it, and the same may be said of the main trunks in that group. Here, in what is considered to be a higher series, the opposite condition prevails, the nerve-centre and main trunks being hypodermal, as are the cords in the majority of the Polychæts. In *Owenia* this belt agrees in minute structure with that surrounding the central system, and occupies a corresponding position.

With the disappearance of a central fillet in the dorsal arch of the body-wall a slightly pale band is noticeable in the hypoderm of the region, yet that layer passes to the basement-tissue (which stains) uninterruptedly, a series of the ends of severed fibres being grasped in spaces bounded by reticulations between the basement-tissue and the adjoining circular muscular fibres. Then the pallor of the inner portion of the hypoderm becomes more pronounced, and in the next section or two (Pl. VII. fig. 1) a distinct nervous layer, as in *Cephalodiscus*, stretches along the mid-dorsal arch. It shows both fine transverse and vertical fibres or striæ, and minute granules occur next the basement-tissue (Pl. VII. fig. 2). It fades on each side into the ordinary cells and areolæ of the hypoderm, which likewise continues to the surface externally without evident break. The nerve-tissue, in short, is marked by no hard-and-fast line from the hypoderm, but is traversed by its fibres, and the neuropile, nemoglia, and neurilemma of the ordinary Polychæt ganglia are not distinguishable. From end to end in section the tissue has a uniform structure, and where, for instance, it is separated from the basement-layer only projecting vertical fibres and granules appear. Certain granules occur at its outer border next the deeply stained cells and granules of the hypoderm, but these could not be associated with the nerve-band, the finely fibrillar edge of which coursed evenly along. In succeeding sections this great nerve-band stretches downward at the sides, becomes more distinctly differentiated from the hypoderm externally and the basement-tissue internally, and then a slight narrowing of the mid-dorsal arch takes place, the lateral extensions being thicker. The mouth is still divided ventrally in these sections, and the nervous expansion extends over the entire arch of the body-wall with the exception of a comparatively short region of the ventral edge of the lateral lip, the thickest layer being lateral, for the dorsal is now diminishing. A narrow layer, apparently of basement-tissue, occurs, as indicated, simultaneously in the sections external to the hypoderm lining the mouth, and



at this level all round, though it is thickest ventro-laterally, and it was this layer which was first encountered in front. The structure of this lateral band of so-called basement-tissue closely resembles that of the central system, and it is possible that it may perform functions of a sensory kind in connection with the lateral flaps of the vestibule. The flaps gradually unite to form the lower half of the vestibule, the thicker band of pale tissue still being retained ventrally with a thin connecting-band dorsally. Proceeding a little backward the main nervous band disappears from the dorsum and is confined to the lateral regions of the body-wall, from which it gradually thins off dorsally. Finally, when the lip-organ appears in the section over the oral gap, a large nerve-cord alone is left at the lower limit of the former nerve-band (Pl. VII. fig. 3, *nc.*), all the hypodermic layer dorsad of it having assumed the usual condition. In sections of *Saccocirrus* near the mouth Dr. Goodrich\* found the lateral cords (his "œsophageal commissures") in a similar position. This limited nerve-area presents in section pale, finely granular, transverse striation, through which delicate fibrils from the hypoderm external to it pass to the basement-tissue. When the circle of the body-wall is complete—that is, immediately behind the oral gap (Pl. VII. fig. 3),—the large nerve-cords are situated a little below the middle line of the body-wall, and have a blood-vessel in the muscle to their inner side. The central region is still lined by hypoderm, and the thick pale band of the inner layer is infero-laterally conspicuous. Then the hypodermic layer of the vestibule passes into the gullet, and sections of the lip-organ (*lp.*) appear, whilst the hypodermic inner lining of the dorsal region is shut off by a deep fold with a narrow layer of hypoderm from the vestibule, the rest of the large arch above having a thick coat of the same tissue. Externally, again, a change has occurred in the mid-ventral line, for the thick lateral coat of hypoderm in which the nerve-cords lie has thinned off ventrally, leaving a considerable area with just a trace of it; but this appears to occur only for a short distance. With the termination of the vestibule lined by hypoderm, and the increase of the lip-organ in section, the ventral hypoderm of the body-wall again gradually thickens from the middle line outward. Moreover, the narrow pocket formed by the first septum lies on each side of the lip-organ (Pl. VII. fig. 4), and then is quite shut off from the upper cavity (vestibule) lined by hypoderm, and which represents the

\* Quart. Journ. Micr. Sci. n. s., vol. xlv.

gullet proper (which may have complex functions), surrounded by a tough (muscular) investment, from which various strands radiate to the body-wall amongst the blood-vessels of the region. The body-wall at this part has a thinner coat of hypoderm both mid-dorsally and mid-ventrally, its thick layer being lateral. The longitudinal muscles form a somewhat thin layer of fasciculi all round, and the lip-organ shows a thick mass of modified vertical cells with nuclei, each mass probably rubbing against the other. The massive lip-organ then forms a thick-walled tube in section, with a central cavity (Pl. VII. fig. 5) and an external muscular investment, whilst the œsophagus has a thick mucous layer, continuous with the hypoderm, to subserve its special functions, the radiating strands and numerous blood-vessels still continuing. These radiating fibres show that the movements of this thick-walled region (Pl. VIII. fig. 18) must be more or less restricted, yet the longitudinal bands, especially on its dorsal wall, would point to protrusion and retraction. Externally the hypoderm—thickest laterally at and above the nerve-cords, which are descending—has increased in depth dorsally, but is thin ventrally. Behind the foregoing the lip-organ loses its central cavity (a fold) and diminishes in size, but its complex muscular coat is proportionally thicker, and in the surrounding area the blood-vessels are larger. Finally, the muscles of the lip-organ alone are visible, and then disappear, showing that it is, in short, attached by a muscular stalk, first hollow and then solid, though the sections would indicate that the muscular fibres (retractor) are fixed to the body-wall close behind and for some distance backward. Moreover, a fan-shaped arrangement (Pl. XII. fig. 17) occurs anteriorly where the fibres spread into the lip-organ. Besides, various oblique and transverse fibres act on the folds and give complexity to the movements (Pl. XI. fig. 16). A double layer of muscular fibres, further, lies beneath the basement-tissue bounding the gland-cells—the one the reverse of the other,—so that in sagittal section the cut ends of one series abut on the thick inner (*i. e.* toward the coelom) belt. Gland-cells also occupy considerable areas internally at the edge of the organ. The whole structure of this organ therefore differs from mere labial folds of the vestibule, as more clearly seen in vertical sections (Pl. VII. fig. 6), the densest part of the cellular layer being toward the middle of the ventral fold and thinning off dorsally and laterally. The lip-organ, in short, is a highly differentiated apparatus, both secretory and manipulative, for the tube-formation and other

functions. It is interesting that Dr. Goodrich \* found a similar organ (his "muscular pad") in *Saccocirrus* and *Protodrilus*. The body-wall at this level again presents a change in its hypoderm (which throughout has a firm exterior film or cuticle), since, though somewhat diminished dorsally, it is now of a considerable thickness mid-ventrally, its densest part being at the nerve-cords, which have moved downward, so that they are separated by about a sixth of the circumference of the body (Pl. VIII. fig. 7). The œsophagus has special fasciculi of muscles laterally and dorsally, besides the radiating fibres.

The next important change is the merging of the œsophageal region of the canal, with its boldly arranged coat continuous with the external hypoderm, into the stomachal region at the third septum, with its granular glandular surface (Pl. VIII. fig. 7) and its external muscular coat, the whole internal surface of the stomach being by-and-by thus transformed.

At the commencement of this region of the gut at the third septum a complex muscular sheath connected with the lip-organ occurs ventrally, with thickened muscular pillars at each side—abutting on a membranous space to the exterior and just over the nerve-trunks, certain of the fibres, moreover, a little further back being attached to the basement-tissue over the outer part of the nerve-cords. Blood-vessels occur in the large space which is thus soon formed below the alimentary canal, and the vessel in the median mesentery (which is attached to the upper border of the mass of muscle stretching from side to side over the area above the nerve-cords—a little behind the section figured in Pl. VIII. fig. 7) is distinct, the special mesenteric area still being visible externally, though much reduced in size. Between the basement-tissue of the body-wall and this transverse muscular mass lie the ventral longitudinal muscles (*vm.*). The great cavity appears to contain cœlomic fluid and corpuscles, and is shut off by a shelf of septal tissue (Pl. VIII. fig. 7, *bt.*) continuous at each side with that of the body-wall, whilst the upper area on each side of the alimentary canal is occupied by elastic connective-tissue strands and by the muscular fasciculi along the dorsal wall of the canal. The body-wall at this region has dorsally the longitudinal muscles (*dm.*), which may be held to cease at the junction of the transverse platform of septal tissue a little below the middle, of longitudinal muscular fibres

\* Quart. Journ. Micr. Sci. n. s., vol. xliv. p. 415, sections 18 & 20.

ending at the junction of the ventral transverse band, and, lastly, of the median (ventral) longitudinal fibres (*vm.*) beneath the latter (Pl. VIII. fig. 7). The nerve-cords at this part are separated by fully a sixth of the circumference of the body-wall. The transverse septal plate above the ventral longitudinal muscles has a central structureless part—apparently of a homogeneous nature (pale and elastic), the muscular fasciculi fraying out especially at the dorsal surface and ends (Pl. VIII. fig. 7 A). In its progress backward a change in the diminishing area between the nerve-trunks is inaugurated, the homogeneous central region of the transverse band, the anterior part of which is indicated in Pl. VIII. fig. 7, being shortened transversely and increased vertically, so that it pushes as a lozenge-shaped and then wedge-shaped area into the centre of the ventral muscular mass, whilst the upper muscular fibres externally become defined as more or less independent masses, bounded externally by sloping muscular fibres which simulate the oblique in certain sections—at least, at their insertion. The lozenge-shaped area of the homogeneous (for it can scarcely be called “tendinous”) tissue thins off on each side to a plate, to the upper edge of which fasciculi of muscular fibres are attached, whilst ventrally processes pass into the median ventral longitudinal muscles. The whole thus forms a complex muscular apparatus attached to the central tough tissue, which gradually in its progress backward shrinks, leaving the fused muscular fasciculi to form the massive ventral longitudinal muscles as shown in Pl. VIII. fig. 8, *vm.* By the gradual diminution of the tough central area of the before-mentioned transverse band to which the median mesentery from the gut is attached, and by the grouping of the several longitudinal ventral muscles into a mass on each side, the typical ventral longitudinal muscles are formed, and at this part they exceed in bulk the dorsal muscles. This evolution of these continuous ventral fasciculi out of the elements in front is probably connected with a change in the function of the contents as well as in the body-wall itself.

The disappearance of the longitudinal muscular fibres and the radiating strands from the dorsal wall of the gut leaves the two halves of the upper division of the coelomic space for coelomic fluid only, and it is separated from the two much larger spaces inferiorly by strong muscular bands at each side of the transversely enlarged alimentary canal; yet the appearance of the canal beneath—to which the median mesentery is attached ventrally—apparently leaves a gap by

which the two cavities communicate superiorly under the transversely enlarged canal.

The anterior end of the stomach is a narrow tube as seen in Pl. XI. fig. 23, and in the various transverse sections. It further presents a bifid border ventrally, a narrow process of the cavity ending in a dilated rim on each side below, the ventral blood-vessel and the mesentery occupying the gap, whilst a spacious sinus surrounds the stomach. This bifid condition gradually disappears, the organ assuming the outline shown in Pl. X. fig. 30.

A mesentery with the dorsal blood-vessel in the centre passes from the upper arch of the gut to the dorsal wall, and another mesentery, with the ventral blood-vessel, goes to the mid-ventral tissues, the coelom being thus divided into halves. Then a process from the wall of the stomach above the rugose and somewhat triangular ventral arch appears, and a little behind is tacked to the ventral portion, and thus cuts it off as a separate canal with folded mucous membrane internally, the longer upper chamber having its inner surface smooth and symmetrically folded. The inferior and somewhat pear-shaped chamber (Pl. VIII. fig. 8, *st.*, stomach) is surrounded by blood-vessels, which form a vascular plexus around it on their way to the branchial region, and from its apex inferiorly a mesentery passes to join a mid-ventral homogeneous (pale tough) area arching over a special muscular region which terminates on each side over the outer edge of the nerve-cord, now approaching that of the opposite side.

At this level the body-wall has thin hypoderm in the mid-dorsal line, then it increases in depth laterally, again becomes thinner, and then swells out ventrally at the nerve-cords. Within are the basement-tissue and circular fibres, then the dorsal longitudinal muscles (*dm.*), which end below the attachment of the upper canal on each side, and the ventral longitudinal (*vm.*), which are more massive, and have the differentiated region with the arched fibres in the middle line, such, indeed, forming the only separation between them. This differentiated region is probably in connection with the movements of the alimentary canal. The nerve-cords in section show a granular and fibrillar aspect, and they are much better differentiated than in front. The occurrence of bristle-tufts makes the separation between the dorsal and the ventral longitudinal muscles more pronounced, and below the tuft is a well-defined pore of the mucous gland with large nuclei in its cellular wall (Pl. VIII. fig. 9, *mp.*), one side abutting on the hypoderm, the other

having muscular fibres from the bristle-tuft attached to it; and the hypoderm is thinned at the tuft and has an incurvation at its upper edge, whilst it rapidly thickens above it. Moreover, a distinct muscular slip (*mc.*) occurs in the mid-ventral line, the remnant of the complex condition in front.

The next change is the infolding of the stomachal wall (Pl. VIII. fig. 10, *st.*), the loss of its lateral connections, and the termination of its cavity; whilst the intestine enlarges, its folds become more prominent and alter their character, resembling, indeed, the œsophageal hypodermic lining. The intestine still shows a plexus of vessels, about seven, for instance, being cut on each side, and they resemble buds from the investment of the gut, though they are only sections of longitudinal trunks with their internal and external investments. The dorsal mesentery and its enclosed vessel now pass upward from the gut-wall, and inferiorly are the ventral mesentery and its vessel, the membrane trending to a fissure between the more massive ventral longitudinal muscles, since the special median muscular area and its fibres (shown in Pl. VIII. fig. 7A) have disappeared. The nerve-cords are separated only by their own breadth from each other, and they are, perhaps, more distinctly granular than before. The mucous glands, with their secretion rendered fibroid by preparation, are now prominent, each placed above the ventral muscle of its side. The cœlomic spaces (Pl. IX. fig. 11, *c.*), reduced to one on each side, have a translucent coagulum with granules.

When the nerve-cords touch and fuse (Pl. IX. fig. 11, *nc.*) it is seen that the glandular tubes in the cœlom approach each side of the ventral vessel, and slope outward as they go forward to the excretory duct below the bristle-tuft. The gut has become pear-shaped, the narrow end being below with its mesentery, whilst two mesenteries pass from the dorsal arch and join before reaching the dorsal blood-vessel. This arrangement makes an additional supra-intestinal chamber.

The hypoderm still presents a symmetrical enlargement just above the bristle-tuft on each side, this thickened region being differentiated by the narrow layer immediately above it, for it gradually deepens dorsally and again becomes narrow as it reaches the mid-dorsal line. From the lower edge of the bristle-tuft it gently increases to the nerve-cords in the mid-ventral line. The dorsal longitudinal muscles are thinner than the massive ventral, but they extend over a larger area of the body-wall.

A little further back (Pl. IX. fig. 12) the gut increases in

vertical diameter, forming a long flattened organ extending from the dorsal to the ventral region in section, and the cellular lining is thrown into rugæ. Both dorsal and ventral short mesenteries are double, and the wall of the dorsal vessel is more muscular. The gut has the same vascular investment as just mentioned, and the vessels lie outside the mesentery just alluded to. At the next bristle-bundle a pore similar to the first gives issue to the secretion of the second pair of glandular tubes. The ventral longitudinal muscles retain their more massive outline.

After an interval the body (Pl. IX. fig. 13) increases in bulk proportionally, but the hypoderm becomes thinner all round, the thickest part being that situated ventrally on each side of the nerve-cords. The ventral longitudinal muscles pass far upward, and encroach on the dorsal, which occupy only the upper arch of the body, and each pair has a distinct median notch into which the mesentery fits, the ventral mesentery having the ovaries or spermaries attached to it laterally, and the contents of which are shed into the cœlom. Two mucous glands in section occupy the upper half of the cœlom on each side, and the nuclei of the cells forming their walls are regularly arranged. The gut stretches nearly from dorsal to ventral arch, held in position by the median mesenteries and also by the septa at intervals. The double attachment superiorly forms a blood-channel, which communicates with a sinus (*sin.*) surrounding the gut, so that here, instead of the isolated though reticulated vessels, there is a continuous blood-channel—a development in all probability attained only in the adult or nearly adult condition. The nerve-cord still has numerous hypodermic fibres passing from the outer to the inner (ventral to dorsal) or *vice versa*, and, in addition, fine reticulations and granules, some of which are probably nuclei. Usually a slight ventral furrow and a median peak dorsally indicate the double nature of the area. The second pair of glandular tubes is situated to the exterior of the first pair in transverse sections.

The sixth segment is distinguished by the presence of Gilson's epidermal tubes, which stretch from the septum between the sixth and seventh segments to that in front. They are readily recognized by their position in transverse sections, viz., dorsad of the groove (Gilson's "*gouttière de la soie*") which runs along the dorso-lateral region. They are canals of considerable size, and are separated from the basement-layer by a stratum of cells, the cavity in section being also bounded externally by an arch of hypodermic cells. Gilson supposed that these hypodermic canals served

for the transmission of the reproductive elements, and possibly also for an interchange between the coelomic cavity and the exterior as in certain Oligochæts. True nephridia, at any rate, are absent in *Owenia*. Whatever the function of these canals may be, Arnold Watson has shown that sperms and ova escape by different channels.

In front of the tail the hypodermic coating of the surface is of moderate thickness. The massive muscular investment is conspicuous, and it is difficult to distinguish where the dorsal longitudinal muscle ends and the ventral begins, though a fold above the mucous gland seems to indicate the separation. The nerve-cords have shrunk to a small lenticular area, which in minute structure has the same fibrillar and granular character as in front. The intestine, held in position by a dorsal and a ventral mesentery, is considerably less, but it has large vessels or sinuses on each side, the ampullæ from the ventral vessel passing into the large gonad below the gut. Two mucous glands are still in evidence under the dorsal wall, and they have the same character as in front. Moreover, their ducts open above the long line of hooks in the space between these and the bristle-tuft, which is now dorsal in position, and so leave the entire lateral wall to the hooks; thus the restricted area occupied by the dorsal longitudinal muscles is defined. The whole lateral and ventral regions are covered by the ventral longitudinal muscles, which, however, are much thinner than the dorsal, the reverse of the condition in front. The conspicuous development of the gonads in this region and the ampullæ of the ventral vessel are noteworthy. The mucous glands have now ceased (Pl. IX. fig. 14).

One of the interesting features toward the tail is the occurrence of the septa (Pl. IX. fig. 15). Their first appearance is indicated by the envelopment of the intestine and its blood-sinuses by a sheath which springs from each side of the vertical mesentery under the dorsal blood-vessel, and stretches to the mid-ventral mesentery considerably below the ventral blood-vessel. In such a view it might be supposed that the middle of the septum has been sliced, leaving the upper and lower attachments; but such will not explain all the outlines of these posterior septa.

Reproductive elements occur in the spaces outside the septum as well as within it and its areas. Then the upper and lower arches separate, each having a zigzag outline as it passes to the body-wall. The coelom is thus divided into six areas—two dorsal, two ventral, and the lateral with the gonads inferiorly on each side of the gut.



The first appearance of the septum in the sections is heralded by a tuft of muscular fibres attached to the exterior of the gut-wall and the ventral septum; then the muscular ring (the ventral septum and the gut being free) loosely envelops the gut and its vessels, besides the ventral blood-vessel and its mesentery, almost to the ventral longitudinal muscles, but leaves the dorsal blood-vessel for the most part free. The septum, indeed, springs on each side from the lower wall of the vessel, and encloses that part of the mesentery between the vessel and the sinus around the gut, whilst the distal part of the mesentery passes freely to the gap between the dorsal longitudinal muscles. This muscular sheath or tubular chamber by-and-by swells out into a large area, its upper arch or roof being attached on each side to the body-wall between the dorsal and ventral longitudinal muscles, and its floor stretches from the median ventral mesentery to the wall of the body a considerable distance below the attachment of the roof. This chamber encloses the alimentary apparatus and the gonads, but the more advanced sperms lie in the two cœlomic chambers outside its roof—that is, between the latter and the body-wall (Pl. IX. fig. 15). It is difficult to explain the exact nature of these septa—whether they are modifications of the ordinary septa, which extend far backward in the caudal region, or only the ordinary septa sliced so as to present these characteristic appearances,—for it is unlikely that two septa would fall into the line of section. These septa seem to differ in disposition and aspect from those in front, and are probably associated with the special functions of the caudal region—respiratory, purely intestinal, or otherwise.

On viewing the animal externally from the dorsum, a broad fillet passes from each side of the collar anteriorly and slopes obliquely inward and backward on the dorsum to the constriction behind the third bristle-tuft, then bends a little outward, and is continued along the dorso-lateral region posteriorly. A groove exists at the collar just below the anterior end, and which apparently is functional also for the median ventral ridge and groove, so that, if ciliated, it may send a current outward and forward to it. These ridges apparently are those which show the remarkable pennate arrangements in the hypoderm in the preparations (Pl. IX. fig. 20).

In certain longitudinal sections (Pl. VIII. fig. 18) the dark pigment stretches as a broad band behind the collar, a gap intervening between it and the edge of the fold behind, such probably representing a sensory groove, and its borders have

the specially modified cells. Von Drasche\* figures the pigment only behind the collar, and his "ganglion" is small and considerably in front of the collar, thus diverging from the condition described here. Zürcher does not deal with this region.

In longitudinal sections a marked feature is the pennate condition of the hypoderm of the anterior region—that is, between the first and second dissepiments, as well as a little in front of the former in certain cases; and it appears to be specially developed on the dorsum. The hypoderm is there thrown into a series of ridges, which in section present a streaked granular basal region terminating externally in a pennate and symmetrical series of small granular cells, after the manner of the barbs of a feather (Pl. IX. fig. 20), the breadth of the ridge varying, whilst the processes (in section) increase in size from behind forward, culminating in the collar with the deep groove in front (Pl. XI. fig. 16, and Pl. VIII. fig. 18). Some of the ridges, springing from the continuous base, are narrow distally, so that the lateral rows of cells are close on the midrib and a few are more or less conical. The transition from the hypoderm of the succeeding segment is by a gradual modification in the arrangement of the vertical cells, which by-and-by are fan-like and then pennate. This pennate condition in the preparations of the hypoderm is apparently limited in distribution, since it is absent in most sections both dorsally and ventrally, and Von Drasche neither mentions nor figures it. Moreover, in transverse sections, so far as observed, it is not seen, and therefore may be due to the arrangement of the cells in a vertical plane after preparation. An approach to this condition of the hypodermic cells is observed in some longitudinal sections of *Myxicola*, but it is less distinct than in *Owenia*, and is probably due likewise to the effect of the preservative fluid acting on a thick glandular hypoderm. The inner edge of the collar has a series of minute cells along its anterior border, and a fan-like series of strands and cells posteriorly, whilst the tip is symmetrically pennate. The anterior curve of the furrow is furnished with a special series of granular pigmented cells, *oc.*, closely arranged at the surface, and which probably have the functions of eyes. They extend the whole length of the collar from side to side on the dorsal surface, and are partly protected by that fold (Pl. VIII. fig. 18, and Pl. XI. fig. 16).

The mucous glands (*mg.*) present either a characteristic

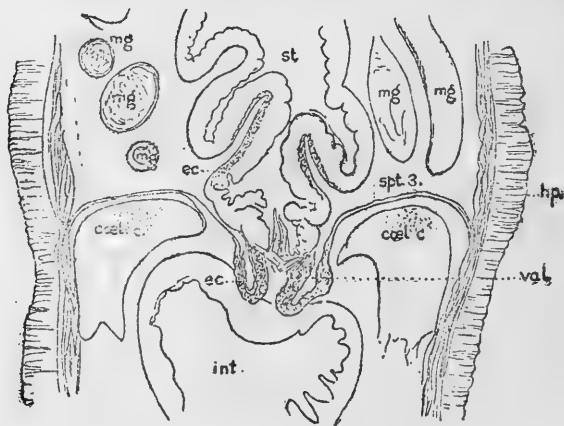
\* *Op. cit.* Taf. i. fig. 3.

pennate aspect in longitudinal section or a series of straight or curved transverse bars, according as the long tube is cut in a median or lateral plane (Pl. X. fig. 19). In the former case a central axis of the secretion is flanked on either side by a series of plates, often slanting distally, and containing an occasional nucleated cell or a series of granules in the plate. Such a condition may be due to the action of the preservative spirit, or to the method of secretion, but it is worthy of note. The slender posterior ends of these glands are curved forward and outward. The secretion forms a lining to the tube, and attaches foreign structures such as sand-particles and foraminifera to it externally; and in many cases, so firmly do the annelids adhere to it after preservation, that rupture of the tissues accompanies their removal.

The hypoderm covering the mouth and buccal region, including the "lip-organ," differs from that on the surface of the body and branchiæ. It is bounded by a uniform and definite investment, and has a finely-granular and fibrillar structure, so that it forms a tougher, more massive, and more consistent layer, which, however, at certain parts diminishes in thickness as it approaches the branchiæ. It rests on a basement-layer having beneath it a complex series of muscular fibres. The same kind of hypoderm dips down and envelops the lip-organ, though it is more translucent in section, from the paucity of granules which stain more deeply. Then the organ forms a deep furrow (Pl. VII. fig. 6) with massive pale walls, whilst a double fold which now appears to the inner side, as well as the folds dorsad of the mouth, stain distinctly, as also do all the folds of the mouth and pharynx. The pale region thus lies in the figure between *a* and *a* in the centre of the organ, but it thins off on each side—that is to say, the middle region of the fold has thickest walls. The buccal mucous membrane is like that first mentioned in the lateral area of the cephalic region, viz., closely fibrous and granular, and it continues to the second diaphragm. It rests on a basement-membrane and a firm outer layer of both circular and longitudinal muscular fibres, the anterior or buccal region having numerous trabeculæ fixing it to the body-wall; and this is specially marked at the thick pale folds (lip-organ, *lp.*, in the various figures). The anterior buccal region is probably capable of partial protrusion. In front of the second diaphragm the folds of the canal have thick muscular walls, so that a certain amount of differentiation exists—either as proventriculus or stomach. Behind the second dissepiment the walls of the canal are

apparently uniform, and contain mud rich in organic remains.

The former or stomachal region enters the following or intestinal region by an aperture which is thrust backward as a cone. Moreover, the walls of the organ undergo a structural differentiation, for a short distance before reaching the aperture (text-fig.) they become finely reticulated and dotted as if formed of muscular or erectile tissue (*ec.*), whilst the lining of the tube consists of the same mucous membrane as in front. Further, the adjoining circular fold of the diaphragm (*spt. 3*) is provided with a similar, though thinner, layer of the same tissue (*ec.*), which likewise



Longitudinal section of the alimentary apparatus at the third septum, *spt. 3*, showing traces of the special muscular layer, *ec.*, enveloping the posterior wall of the stomach and its sinuses, and continued over the valvular region, *val.*; *hp.*, hypoderm; *coel. c.*, coelomic corpuscles; *mg.*, mucous glands.

occurs in two of the folds of the organ in front of the foregoing. This tissue is apparently muscular, and its minute structure is interesting as showing the peculiar muscle-cells with their granular contents and nuclei which stud the free border of the muscle. Zürcher \* has given a good description and figures of the structure of this tissue. It evidently controls not only the wall of the canal but the blood-sinus on its outer surface, and thus may have considerable effect on the main trunks proceeding forward to the branchiæ. The coelomic corpuscles often form a

\* *Op. cit.* p. 203, and figs. 33 & 35.

translucent mass (*cœl.c.*) behind the diaphragm and on each side of the gut.

*Myriochele*, the second genus of the Ammocharidæ, differs from *Owenia* in the simplicity of its anterior end, for it is broadly truncated, with a smooth margin, a deep pit or vestibule leading to the mouth, and a ventral fissure; yet it is found that, though the branchiæ are absent, the nervous system is formed much on the same plan as that of *Owenia*. *Myriochele* is even more broadly truncate than *Owenia*, and as a transparent object its large blood-vessels in front and the great longitudinal mucous glands which follow give the body a striped aspect.

The cilia covering the large funnel-shaped oral cavity of *Myriochele* are long and powerful, so that the currents they cause are probably considerable. Moreover, the oral aperture is oblique, the rim dipping backward to the notch at the ventral border, thus somewhat resembling the condition in the young of *Owenia*, though the oral gap is larger.

In the early sections of the snout of *Myriochele* the hypoderm presents more distinct elements than in *Owenia*, and it appears to be somewhat thicker, its minute cells and granules in the gelatinous matrix being conspicuous. The sections have a horseshoe-shaped appearance, the wide oral gap beneath forming the heel of the shoe, which, however, is tapered at the tip, the wall thinning off at each side. The exterior of the shoe has cuticle, glandular hypoderm, and basement-tissue resting on a gelatinoid layer which has numerous minute nucleated cells along both outer and inner borders. Basement-tissue, again, bounds the vestibular hypoderm on the inner border, which differs from that of the outer wall in having a distinct inner coat, from which cilia probably spring. The basement-layer in both cases is apparently elastic. The surface-layer of hypoderm often presents clear spaces or vacuoles—probably from rupture and extrusion of the glandular tissue. Moreover, its external surface forms a more definite cuticle, whilst its inner border rests on the basement-layer, no nervous belt appearing in the first sections; but circular fibres occur within the basement-layer, and then a well-developed longitudinal coat of muscle which stretches downward to the oral edge, from which the epithelium of the mouth passes inward (Pl. XI. fig. 22) as a thick layer of cylindrical cells with nuclei, bounded internally by a thin sheet of circular fibres and a few longitudinal strands. The space (*cœlom*) between the body-wall and the oral wall shows many

granular cells with fine connective-tissue fibres at certain parts, besides blood-vessels. Then a narrow pale belt becomes distinct within the circular fibres and basement-tissue of the oral wall, apparently corresponding to the pale sensory layer of *Owenia* in the same region. The nerve-centre appears as a narrow pale granular band in section at the inner border of the hypoderm of the body-wall, and stretching downward from the dorsum (Pl. XI. fig. 22) as it passes by-and-by into the trunks connecting it with the ventral cord. This region therefore represents the prostomium, though devoid of any external indication. The minuteness of the nerve-centre in comparison with that of *Owenia* renders its finer details obscure, and it is more transparent. No fine strands from the hypoderm could be made out, the slightly prominent cells and interstitial tissue alone appearing at the edge, whilst its inner border rested on a smooth basement-tissue. Its position and extent agree with that in *Owenia*.

In horizontal (longitudinal) sections the central nervous system appears as an area at the inner border of the hypoderm about the point of the V-shaped oral funnel (Pl. XI. fig. 23), and its transverse breadth is shown by its appearing on each side in these sections. So far as can be ascertained in the preparations, no special sensory apparatus is present either in the form of a groove or deposit of pigment in the body-wall, but the pigment may have been removed by long preservation in spirit. Therein it differs from *Owenia* with its pigmented cells and its groove.

Then, the hypoderm, again, extends over the whole depth to the basement-layer dorsally, and the nerve-cords are differentiated laterally—at first high up, nearly on a level with the dorsal arch of the mouth (Pl. XI. fig. 25), and then gradually descending as in *Owenia*. Very soon between the mid-dorsal and the oral walls a blood-vessel appears, and one in each lateral space, the connective-tissue strands and cells which connect the walls apparently keeping them more or less in position, the vessels being proportionally large for the size of the annelid and perhaps subserving respiration (Pl. XI. fig. 25 and Pl. XII. fig. 24, *bv.*). When the body-wall becomes continuous—that is, just behind the ventral (oral) slit—the cords have reached the commencement of the lower third of the body-wall, and the median arch dorsally and the mid-lateral regions of the gullet present the thickest layer of cells, the upper angles and the lower edges being thinner. Moreover, a section of

the lip-organ (*lp.*) appears. A pale band indicates a differentiation outside the cellular layer dorsally and another laterally. The chamber by-and-by assumes a figure-of-8 outline, the section of the lip-organ occurring in the lower division; and this shows a dorsal lenticular region of firm pale nucleated cells, somewhat symmetrically arranged, the lower part still having its cavity surrounded by the softer and more deeply-stained nucleated cells of the vestibule (Pl. XI. fig. 26). The figure-of-8 outline of the chamber is now complicated by a median process on each side and by the appearance of a diverticulum (gullet) dorsally, whilst the increase in its size diminishes the space between it and the body-wall laterally and superiorly, though from the first it clings to that wall ventrally. The pale streaked dorsal region of the lip-organ is gradually increasing in size as the sections pass backward; the diverticulum joins the upper region of the canal, which is soon separated from the lower by the junction of the median processes or isthmuses, thus confining the lip-organ to a special chamber (Pl. XII. fig. 27). The upper chamber is lined by the soft cellular mucous coat; the lower has a thin lining of epithelium, with longitudinal and a few circular muscular fibres externally, the whole becoming continuous with the upper edge of the lip-organ on each side, the remains of the ventral wall with its mucous lining at first linking it to the lip-organ and then disappearing, the mid-ventral region being occupied by strong muscular fibres, probably the protractor of the organ. The nerve-cords are on each side and widely separated, and the ventral wall of the body is very thin. A blood-vessel lies on each side at the upper edge of the lower chamber; a section of a succeeding part of the canal appears at the upper border of the wall of the lower chamber, and soon stretches across the entire region. A change is also taking place in the upper chamber, the lower region of which is thickened and its cells rendered paler. In the roof of the lower chamber the cells are assuming the chordoid condition of those in the lower region, so that very soon both halves make an efficient organ for compression or manipulation. The upper chamber becomes also smaller, and the space between the two larger. Strong muscular fascicules appear both dorsally and ventrally over the lingual organ in the lower chamber; and the nuclei in the elongated cells of the modified organ form a row nearer the outer than the inner border. In the interval between the upper and lower chambers another diverticulum of the upper chamber has

been intruding, and is easily recognized by the numerous nuclei. The halves of the lip-organ in the lower chamber are becoming continuous and, fusing, form a dense cylinder with only a chink in the centre, the nuclei of the cells being situated near the external border. The alimentary canal in the upper region occupies more than half the area within the body-wall. At this level the hypoderm is thickest laterally and has increased ventrally with the downward progress of the nerve-cords, the lip-organ is now solid in section and smaller, whilst the canal above has increased in size, and a central chamber of different cellular structure makes its appearance, whilst by-and-by only muscular fibres occupy the place of the lip-organ inferiorly, and a cœlomic space occurs at each side. The nerve-cords touch and soon fuse.

The alimentary canal now takes a median position in the body-cavity, with a dorsal and a ventral mesentery, and it occupies a large space. The thinning of the dorsal longitudinal muscles in the mid-lateral region indicates a differentiation, whilst a considerable mass over the ventral nerve-cord and a thinner layer on each side represent the longitudinal ventral muscles. The mucous glands now appear toward the lower region of the cœlom, and they seem to have the same structure (Pl. XII. fig. 28) as in *Owenia*, and to open by similar wide ducts. The dorsal and ventral blood-vessels in the respective mesenteries are large. The hypoderm at this level is thick all round, especially ventrally, where the nerve-cords are in juxtaposition, and the dorsal and ventral longitudinal muscles are thicker and better differentiated (Pl. XII. fig. 29). The alimentary canal next presents various wrinkles; and a pale band passes from each side of the nerve-cords (which are proportionally large) outside the basement-layer, as if extension were indicated. The alimentary canal is thrown into deep folds, as if a stomachal or gizzard-like part existed in the lateral regions, whilst the dorsal and ventral arches have the ordinary mucous structure; then considerable vertical constriction occurs, the dorsal and ventral arches disappear, and a vascular sinus is established laterally. Thereafter the gut is pointed above and is split into two lobes ventrally, with muscular bundles in the gap. The latter (gap) by-and-by disappears, the canal enlarges, the lumen is much filled up with the dense coating of cells, and the vascular sinus around it is continuous in the sections (Pl. X. fig. 30). Externally at this level the hypoderm is massive ventrally, thins off laterally, and again becomes thin dorsally. The longitudinal muscular coat is thinner, and fibres radiate from a little



above the duct of a mucous gland, impinging on the wall of the blood-sinus on one side, and apparently attached to the depression in the hypoderm and indicative of an opening in the mid-lateral region. The epithelium in the food-canal differs quite from that in front, being almost fibro-granular in aspect from the elongation of the cells, the nuclei of which lie toward the outer border, and at first the surface presents reticulations. The alimentary canal enlarges behind the foregoing, but the character of the mucous lining remains the same, and the ventral blood-vessel lies in the mesentery over the nerve-cord, which is large, with a median peak dorsally and a specially thickened hypodermic layer at each side. On the dorso-lateral regions of the body the hypoderm appears to be thicker than on the mid-dorsal and mid-lateral parts. No specialized dorsal blood-vessel appears in this region, for it has fused with the sinus.

In horizontal longitudinal section (Pl. XI. fig. 23) the alimentary apparatus has a similar appearance at the second septum to that shown in *Owenia*, though the details are slightly different and the scale is much less. The mucous lining is thickened as it approaches the septum, and a centro-lateral fold bulges forward into the stomachal or gizzard-like division, whilst the central opening is narrowed and enters the succeeding part of the alimentary canal as a prominent papilla. The narrow termination of this region stains more deeply than the rest; indeed, it is coloured like the muscular septum, so that it is probable that it has specially developed muscular fibres at this part so as to enable it to perform sphincter-like functions, the food being retained in this chamber for some time and then permitted to pass backward by relaxation of the muscular guard.

In vertical sections of the middle region the gut is at first flask-shaped, the wide part, with the contents, being dorsal, the narrow part ventral; and the mucous lining has again altered its character, the cells being larger, their nuclei larger, and the inner edge smooth. The coelomic space in the female is distended on both sides with large ova having a clear nucleus, an opaque nucleolus, and granular contents, and they spring from the epithelium of the mesentery below the ventral blood-vessel, the smaller ova being inferior, the larger superior. A noteworthy change is the disappearance of the blood-sinus around the gut and the presence of a dorsal vessel in the upper mesentery, the ventral trunk remaining as before. The thick layer of hypoderm ventrally has a furrow over the median nerve-cord, and this coat is comparatively thin laterally and dorsally. The dorsal and

ventral mesenteries separate the muscles of the sides, but there is little to distinguish between the areas of the dorsal and the ventral muscles respectively.

Proceeding backward the epithelium of the gut becomes somewhat finer, the longitudinal muscles form a uniform layer all round without evident differentiation other than the attachment of the median mesenteries, and the hypoderm still remains thicker ventrally, whilst the blood-vessels and ova show no change. A gelatinoid (protoplasmic) layer envelops the longitudinal muscles internally, the representative of the coelomic epithelial layer.

Then the intestine in section shows a keel ventrally, and septal strands, apparently muscular, pass from it to the body-wall, making membranous (and partly muscular) septa to the latter, viz., one on each side of the gut. These septa, however, soon reach the dorsal region and become attached to a process from the dorsal wall of the gut on each side, the dilated (globular) region of the canal being filled with food below these, the ventral portion forming a solid apex. The septa tend to mount upward on the interior of the body-wall, leaving two great areas ventrally on each side of the canal and a narrow dorsal chamber above the septa. Finally, the septum disappears, leaving only a small vessel at the dorsal mesentery. Then a sinus again forms on the upper wall of the gut, the ova continue as in front, and the section of the nerve-cord is more or less circular.

Behind the former region the body-wall becomes somewhat thinner, the thickest region of the areolated hypoderm being the ventral. The nerve-area is comparatively large and ovoid. The basement-layer and, it may be, fine circular fibres occur internally, whilst the longitudinal muscular fibres are only differentiated by the median mesenteries dorsally and ventrally. The gut is large, with a firm external wall and a single layer of cylindrical epithelium, the nuclei being symmetrically arranged in the middle. No dorsal vessel is visible, but the frilled external wall of a sinus occurs laterally on the intestine. The ventral blood-vessel is large and the mesentery leading to the ventral wall is loaded on each side with developing ova, the larger forms distending the coelomic cavity on each side (Pl. IX. fig. 31).

The tip of the tail is bilobed, with, in addition, a ventral median semicircular lobe, and is richly ciliated (Pl. X. fig. 32), a short terminal portion of the intestine being straight, the next (in front) being indicated by a slight constriction, whilst the third is almost elliptical, from marked constrictions in front and rear. In most cases, when removed from the

tubes after preservation, the caudal region is thrown into various zig-zags or spirals, and the tufts of bristles are more conspicuous than in front. One or two of the terminal bristles are single on each side, those preceding being in groups of two, three, four, and five or more. In certain examples, in lateral view, the ventral process at the tip of the tail projects more than the dorsal, though, perhaps, irregularity of the dorsal lobes occasionally occurs. The arrangement of the septa is apparently on a similar plan to that in *Owenia*, where they are very distinct. The septa in *Myriochele* probably cause the constrictions, and the tips of the lozenge-shaped sections of the intestine are fixed by membranous attachments to the body-wall. A pinnate aspect is apparently due to the blood collecting at the septa, where it was darkened by the stain (hæmatoxylin). The reproductive elements appear to be lodged on each side posteriorly, but their mode of exit has not been demonstrated. So far as could be made out, no pores were present posteriorly.

In sagittal sections of the tail (Pl. X. fig. 33) the constriction present a short distance from the tip appears to be normal, the gut being narrowed at this point and furnished with a valvular process projecting forward (*val.p.*). The terminal region of the body thus marked off is divided dorsally into five compartments by short transverse septa, on the anterior faces of which layers of blood occur, probably from extravasation, as no walls other than the septa are visible. The continuation of comparatively large intestinal sinuses almost to the tip of the tail, in addition to the ventral trunk, indicates their importance in the economy of the annelid, probably in connection with a respiratory function.

The transverse sections of the extreme tip of the tail show a ring of hypoderm with a ventral gap (Pl. X. fig. 34), on each side of which the wall is thickened, so that it is lobate. Moreover, a differentiation occurs in this lobate part, as if an aperture existed; but such may be due simply to the more vacuolated condition of the hypoderm of this region. The cells are larger than on the dorsal surface, and after the completion of the posterior aperture they form a distinct pale area on each side of the middle line (Pl. X. fig. 35). The gut shows, almost before its closure, traces of the vascular sinus (Pl. X. fig. 35, *vs.*) on each side, the blood in which had been rendered of a deep purplish-black hue by the action of hæmatoxylin; and soon the ventral vessel appears, the lateral sinuses greatly increase in size, whilst ova are present between the ventral vessel and the body-wall, the nuclei in these being

deeply stained. The lateral sinuses leave only a small portion of the gut bare above the ventral vessel in front of the foregoing sections, and the ova occupy the lateral regions, though their position is variable, for they by-and-by appear, as the body enlarges, below the alimentary canal and the vessels.

The fine sand-tubes of this form abound in such regions as the Gulf of St. Lawrence, and occasionally one end (the caudal) is terminated by a long tapering filament of the secretion covered with sand.

The main feature in forms like the present is the partial differentiation of the nerve-tissue from the hypoderm with which it is in continuity at its centre. No sheath is evident anywhere, even in the more distinctly outlined nerve-cords posteriorly. Yet the position of the cephalic centre and its connection by two trunks with the ventral nerve-cord agree with the general type. The innervation of the alimentary canal seems to be carried out on a similar plan to that of the main system, viz., by contact with a sensitive layer rather than by special twigs, since the latter have not been met with in sections. The whole nervous apparatus, indeed, is in an elementary condition, and in marked contrast, for instance, with that of such highly differentiated types as *Bispira* and *Branchionoma*, where a chordoid skeleton protects the central ganglia and the neuroglia is much developed, the whole central system being shielded by the tissues around it, and so in the brain of *Glycera* as described by Gravier\*, in various types by Eisig, and in the brain of *Lagis* as shown by Nilsson†. In *Owenia* and *Myriochele* the trunks from the central system are not œsophageal, but run externally in the hypoderm to join the ventral cord. Both *Owenia* and *Myriochele* appear to have certain larval characters, as seen in the young of various polychæts, for instance, in Kleinenberg's‡ *Lopadorhynchus*, in which, amongst other features, the nervous system of the gullet may approach that of the enigmatical pale layer in the vestibule of the present species. The structure of *Saccocirrus*, as given by Goodrich§, also presents certain analogous conditions.

The alimentary canal of both *Owenia* and *Myriochele* shows certain valvular complexities, doubtless associated with the nature of their food—viz., mud or sandy mud containing organic particles of various kinds. Carried into the

\* Bull. Sc. France et Belg. t. xxxi. p. 159.

† 'Beiträge der Kennt. des Nervensystems der Polychæten,' Upsala, 1912.

‡ 'Die Entstehung des Annel. aus der Larva von *Lopadorhynchus*,' 1886.

§ *Op. cit.*

vestibule by ciliary currents, it would in the first instance be subjected to the action of the œsophagus, then passed in certain quantities into the stomach with its mobile glandular walls, and subsequently sent through the funnel-like muscular valve at the third septum into the intestine. The occurrence, moreover, of the valve-like folds towards the posterior end of the intestine in *Myriochele*, with the adjacent vascular apparatus, would seem to indicate special functions there, both in regard to the contents of the gut and respiration.

The central nervous system in *Owenia* and *Myriochele* does not conform to the typical three regions of the able investigator Racovitza—viz., the paired “région palpaire” giving branches to the palpi, the unpaired “sincipital” giving branches to the eyes and tentacles, and the paired “nuchal” to the ciliated sensory grooves; or to those of other authors of more recent date, the elementary condition, perhaps, being associated with the feebly developed and much modified prostomium, especially in *Myriochele*. Further, the contrast between the typical form with its circumœsophageal commissures is noteworthy, since the homologues of these are as much hypodermal as the central mass, for the nervous layer beneath the hypoderm of the vestibule essentially differs.

Another feature of moment is the absence of distinct nephridia in both *Owenia* and *Myriochele*, the only representative of a tube communicating with the coelom and the exterior being Gilson’s long hypodermic tube in the sixth segment, and which apparently is indicated in Delle Chiaje’s\* original figure as two zig-zag tubes between two bristle-tufts; and the author was also acquainted with the long mucous glands and the general arrangement of the branchiæ and their blood-supply. The addition of two eyes to one of the figures (2), with a pair of pinnate branchiæ, is, however, more or less imaginary.

Again, the general structure of *Owenia* and *Myriochele*, as representing the family Ammocharidæ, gives small grounds for their association under the same suborder, as Prof. Benham in his earlier classifications† seemed to think, with the Spionidæ and Chætopteridæ in his group Spionoformia, which really comprehends these only, since his Polydoridæ and Magelonidæ, of which separate families are made, can without undue laxity be placed under the Spionidæ. Levisen, indeed, had previously made a separate group for

\* Discriz. e Nat. degli Anim. Invert. pl. 175. figs. 1–5 (1841).

† ‘The Cambridge Natural History,’ vol. ii. p. 258 (1896).

his "Ammochariformia," keeping under his "Syllidiformia Spionina" the Spionidæ, Chætopteridæ, Cirratulidæ, Ari-ciidæ, Chloræmidæ (?), and Opheliidæ, an assemblage even more complex than that of Prof. Benham.

*Explanation of the letters used in the figures.*

- bv.* Blood-vessels.
- c.* Central nervous system.
- cm.* Circular muscular coat.
- cæ.* Cœlom.
- cæ.l.c.* Cœlomic corpuscles.
- dm.* Dorsal longitudinal muscles.
- dv.* Dorsal blood-vessel.
- ec.* Special layer of gut and diaphragm.
- g.* Gonads.
- hp.* Hypoderm.
- hpe.* Thickened layer of hypoderm.
- int.* Intestine.
- lp.* Lip-organ.
- m.* Mouth.
- mg.* Mucous glands.
- mp.* Pore of mucous gland.
- nc.* Nerve-cord.
- æs.* Esophagus.
- ov.* Ova.
- spt.* Septum.
- st.* Stomach.
- val.p.* Valvular process of alimentary canal.
- vm.* Ventral longitudinal muscles.
- vs.* Vascular sinus.
- vv.* Blood-vessels.

EXPLANATION OF THE PLATES \*.

PLATE VII.

- Fig. 1.* Transverse section of the anterior end of *Owenia fusiformis*, Della Chiaje, to show the central nervous system (*c.*). *m.*, mouth, the lining of hypoderm also having a pale band beneath it at *mc.* The ventral gap in the body-wall is still open.  $\times$  Zeiss oc. 2, obj. A.
- Fig. 2.* More highly magnified view of the central nervous system, *c.*, as part of the hypoderm, *hp.*, *cm.* Circular muscular coat.  $\times$  oc. 4, obj. D.
- Fig. 3.* Transverse section after the completion of the body-wall in front and the appearance of the lip-organ *lp.* *nc.*, nerve-cord.  $\times$  oc. 2, obj. A.
- Fig. 4.* Section behind the foregoing. The vestibule is now contracting, and the lip-organ, *lp.*, is in full development, with its inner bifid region and more massive external part.  $\times$  oc. 2, obj. A.

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\* I am indebted to the Carnegie Trust for part of these figures.

- Fig. 5.* The wall of the œsophagus, *œs.*, as the sections proceed backward, is completed, and various blood-vessels, *vv.*, including the dorsal trunk, *dv.*, are prominent. The lip-organ, *lp.*, presents a basal mass with a central chink, and a regular arrangement of its tissue.  $\times$  oc. 2, obj. A.
- Fig. 6.* Vertical section of *Owenia fusiformis*. *a.*, the vestibule; *c.*, central nervous system; *lp.*, lip-organ; *mg.*, mucous gland; *spt.*, septum. The section is imperfect at *x*.  $\times$  about 40 diam.

## PLATE VIII.

- Fig. 7.* Transverse section behind the folds of the lip-organ and at the point where the tendinous transverse band, *bt.*, and its lateral connections occur in the ventral region.  $\times$  oc. 2, obj. A.
- Fig. 7 A.* Transverse section indicating the condition of the parts of the lozenge-shaped tendinous region ventrally, as its upper and outer edges differentiate into muscular fibres and strands pass into the fasciculi beneath.  $\times$  oc. 2, obj. A.
- Fig. 8.* Transverse section behind the foregoing, showing the diminishing, pale, elastic band, *bt.*, and the complete condition of the ventral longitudinal muscles, *vm.* The stomachal region is surrounded by blood-vessels, *bv.*  $\times$  oc. 2, obj. A.
- Fig. 9.* Section in the line of the bristle-tufts with the opening of the mucous gland, *mp.* The stomach is still surrounded by the various vessels and their mesenteries. A trace of the elastic system is seen in the muscular differentiation, *mc.*, of the mid-ventral area.  $\times$  oc. 2, obj. A.
- Fig. 10.* The thickening of the dorsal and ventral walls of the stomach is conspicuous in this section (behind *fig. 9*). On the left is a bristle-tuft, *br.* The median dorsal and ventral blood-vessels and their mesenteries, and the ducts of the mucous glands are seen on the way to the anterior.  $\times$  oc. 2, obj. A.
- Fig. 18.* Vertical section of the region of the collar, *col.*, and the central nervous system, *c.*, with the adjoining body-wall.  $\times$  oc. 4, obj. D, with 2-inch draw-tube.

## PLATE IX.

- Fig. 11.* The body-wall has attained its general arrangement with the exception of the thickened lateral portions of hypoderm, *hpe.* The coelomic space is large, and the median dorsal mesentery is split inferiorly. The nerve-cords have now fused.  $\times$  oc. 2, obj. A.
- Fig. 12.* In this section, which is posterior to the preceding, the vertical elongation of the alimentary canal is noteworthy, and the accompanying vessels are still separate, though in some fusion is indicated. The coelom has its corpuscles, and the mucous glands and their ducts are distinct.  $\times$  oc. 2, obj. A.
- Fig. 13.* Transverse section after a considerable interval backward from the foregoing, showing the great extent of the ventral longitudinal muscles, *vm.*, and the commencement of the male gonads, *g.*, below the gut. The large area occupied by the intestine and its enveloping sinus is noteworthy.  $\times$  oc. 2, obj. A.

- Fig. 14.* Section in front of the tail in a ripe male. The gut is still enveloped in the spacioussinus, *vs.*, with its dorsal and ventral mesenteries, and the cœlomic cavity is loaded with sperms. The gonads, *g.*, are large, as also is their blood-supply, *bv.*, whilst the nerve-cord is smaller than in front. The arrangement of the muscles of the body-wall diverges from that in front, since the dorsal longitudinal muscles, *dm.*, are thickened on each side of the middle line, as are also the ventral above the nerve-cord; but in the figure the parts have been separated by the methods of technique. The hooks, *u.*, occur in numbers along the whole lateral region on each side, the bristle-tufts being shifted to the dorsal aspect.  $\times$  oc. 2, obj. A.
- Fig. 15.* Section through the characteristic arrangement of the caudal septa, *spt.*, some distance behind *fig. 14*. The gonads, *g.*, in this region increase in size from before backward, and the free sperms lie in the chamber above the upper septa. A transverse septum is seen below the gonads. The dorsal longitudinal muscles are thickest, whilst the ventral cover two-thirds of the body-wall.  $\times$  oc. 2, obj. A.
- Fig. 20.* Peculiar pennate arrangement of the gelatinous tissue and glands of the hypoderm anteriorly.  $\times$  oc. 4, obj. D, with full draw-tube.
- Fig. 31.* Transverse section of the posterior region in a female with well-developed ova, *ov.*, which arise from the vascular ovigerous tissue ventrally, as in the male; some are cut and others altered by compression.  $\times$  100 diam.

## PLATE X.

- Fig. 19.* Longitudinal section showing the arrangement of the mucus in the mucous glands.  $\times$  oc. 2, obj. 4.
- Fig. 30.* Section through the stomach after the blood-sinus, *vs.*, around it is established. *mg.*, mucous gland; *bv.*, blood-vessels. The median ventral furrow, making the organ bifid in section, has now disappeared.  $\times$  100 diam.
- Fig. 32.* Tip of the tail of *Myriochele* protruding from a tube. Two dorsal papillæ and a slightly more prominent ventral papilla occur posteriorly. The zig-zag condition of the gut in this region is indicated.  $\times$  60 diam.
- Fig. 33.* Section of the tip of the tail of *Myriochele*, showing the valvular apparatus, *val.p.*, at the constriction of the body-wall, the septa, *spt.* The blood has been rendered opaque blackish by the hæmatoxylin used in the technique, and apparently has accumulated at the septa.
- Fig. 34.* Transverse section of the extreme tip of the tail of a female with the modified areolæ of the hypoderm, a larger area on each side being evident.  $\times$  oc. 2, obj. D, with 1 inch of draw-tube.
- Fig. 35.* Section of the tail a little in front of the foregoing, showing the large areolæ of the hypoderm and the blood in the sinus, *vs.*, around the gut.  $\times$  oc. 2, obj. D, with 2-inch draw-tube.



## PLATE XI.

- Fig. 16.* Vertical section of one half of the anterior end of *Owenia fusi-formis* cutting the nerve-centre, *c.*, across, and showing its relation to the sensory groove with its pigment-corpuscles on the anterior wall, in close relation to the central nervous system. A fold of the vestibule is seen at *vt.*  $\times$  oc. 2, obj. A, with 1-inch draw-tube.
- Fig. 22.* Transverse section a little behind the tip of the snout of *Myriochele* on the appearance of the pale central nervous system, *c.*, which becomes continuous with the nerve-cord on each side. The mottled condition of the hypoderm anteriorly is characteristic of this form.  $\times$  about 100 diam.
- Fig. 23.* Horizontal section through the vestibule and three regions of the alimentary canal, viz., *æs.*, oesophagus, *st.*, stomach, and *int.*, intestine. *spt.*, septa; *val.*, valvular apparatus; *c.*, central nervous system; *bv.*, blood-vessels, in some cases the dark blood (coloured by hæmatoxylin) has been pushed beyond the line of the vessel.  $\times$  Zeiss oc. 4, obj. A, with  $1\frac{1}{2}$ -inch draw-tube.
- Fig. 25.* In this section the cords are descending, being a little below the middle line, and the sides of the vestibule are now slightly united. Dorsal and lateral blood-vessels are in a similar position to those in the foregoing figure.  $\times$  100 diam.
- Fig. 26.* The body-wall is completed, as also is the vestibule. The nerve-cords, *nc.*, are descending, and a section of the lip-organ, *lp.*, appears.  $\times$  100 diam.

## PLATE XII.

- Fig. 17.* Sagittal section of the anterior end, to illustrate the complex interlacing of the muscular fibres. The collar, *col.*, and central nervous system, *c.*, are seen on the left.  $\times$  oc. 2, obj. A, with 1-inch draw-tube.
- Fig. 24.* Transverse section before the completion of the body-wall. The nerve-centre, *c.*, is well shown, and probably the lower ends represent the commencement of the nerve-cords. Blood-vessels, *bv.*, occur both dorsally and laterally.  $\times$  100 diam.
- Fig. 27.* In this section the outline of the body is slightly altered, the vertical exceeding the transverse diameter. *æs.*, oesophagus with its cellular lining; *lp.*, lip-organ and its radiate arrangement of cells; *bv.*, blood-vessels. The dorsal and ventral portions of the walls are much attenuated, partly from stretching.  $\times$  100 diam.
- Fig. 28.* The diminution of the dorsal hypoderm and the increase of the ventral hypoderm are indicated in this figure, together with the great size of the oesophagus. The nerve-cords are approaching each other.  $\times$  100 diam.
- Fig. 29.* Transverse section after the union of the nerve-cords, *nc.* The succeeding region of the canal is joining the oesophagus on the right, and two mucous glands, *mg.*, are cut obliquely.  $\times$  100 diam.

XX. — *Notes on Exotic Helomyzidæ, Sciomyzidæ, and Psilidæ.* By C. G. LAMB, M.A., B.Sc., Clare College, Cambridge.

### *Helomyzidæ.*

#### HELOMYZA, Fall.

In the Wiener Ent. Zeit. for 1904 Czerny critically examined all the species of this genus up to that date ; since then only about half a dozen species have been added, and hence the task of working out the specimens in the collections was much simplified. There was one well-known species and three new ones, one of the latter being very interesting as departing from the almost universal character of having extra costal bristles.

#### *Helomyza picta*, Wied.

S. RHODESIA: Chirinda Forest (G. A. K. Marshall, Camb. Coll.).

There was a fair series of this handsome insect. It exhibits considerable sexual dimorphism. The sex described is the male, and it has the dorsum elegantly variegated in ochre and dark ochreous grey ; its femora are beautifully and regularly spindle-shaped, the mid pair less so, and they bear long dense hairs below. The female has a quite dark dull brown dorsum and scutellum, which exhibit only faint signs of the male marks ; the femora are normal, less haired, and the front ones have an anterior spine row—in fact, the sexual differences in the legs are like those of some *Scatophagas*. This type of *Helomyza* is devoid of the upper patches carrying the orbital bristles, and also of the small ocellar triangle joined to these, which are usual in the European forms ; it has also pictured wings and swollen and hairy male femora ; this form seems to be typically African. Speiser, in his Kilimandjaro-Meru Expedition paper, describes two males of the same facies—*H. acroleuca* and *H. lucinata*—and the next species also belongs to this section.

#### *Helomyza ingens*, sp. n.

A single male of the *picta* group was present ; it is larger and more stoutly built than that species.

Head (top view) :—Frons and antennæ entirely yellow to orange, in front a little darker, with microscopic hairs and

irregular reddish patches, but with no sign of dark or blackened spots except the usual hairy neck-spot, an excessively faint large spot behind the vibrissa, and the brownish-red ocellar spot; the antenna has a darkish flagellum with very long hairs, and the third joint has its absolute ridge red. Side-view:—Jowls, palpi, tongue (also the face) all yellow; hind head and lower side bristly as usual; vibrissa very strong; eyes rather rectangularly oval, with long axis vertical; jowls about as deep as breadth of third joint of antenna.

Thorax: dorsum dull dark coffee-brown, except the much lighter callus and front of dorsum; the light part quickly merges into the dark just as the true dorsum begins; two dark lines start near the neck, and continue right over the dorsum, but are necessarily very faint on the dark part; between them, and also along the d. c. lines, are two faint narrow lines showing up more ochreous than the rest. Scutellum flat, slightly shining, quite bare, with a few tiny ridge-hairs between end- and side-bristles. All the macrochètes are long, but slender for the size of the insect; side above the notopleural suture from the callus rather brown and shining, below the pleura is as dark as dorsum, though a little more shining; mesopleura absolutely bare; metanotum dull, more grey; all bristles normal.

Wings darkened, the costal bristles stout and about fifteen in number from end of vein 1, ceasing about level of hind cross-vein. The general colour of the wing is brown; from the end of 1 to the tip a darker brown covers the wing up to about the middle of the cubital cell; the distal part of this extra darkening extends across the wing; the basal parts of veins 3 and 4 are included in another darkened area, the small cross-vein and neighbouring parts of 3 and 4 in another, and the hind cross-vein and near parts of 3 in yet another; there are clear "windows" between the veins at the base, and the usual "window" just distal of the anal cell shows very brightly; the absolute costa between ends of 2 and 4 is pale ochreous, but otherwise all the veins are brown. Halteres clear white.

Legs: femora all elegantly spindled, mid less so than others, with long profuse blackish hairs at sides and below. Colour: all coxæ and trochanters orange, more or less darkened, all femora shining black, all tibiæ orange, front with black tip, hind suffused; all with long hairs below, which are excessively long on distal half of middle tibia; all tarsi orange, the last joints dark and first joint of middle one with very long hairs. Bristles:—front femur a superior row of about 7,

tibia with a distal anterior row of 3; mid tibia with crown of about 4, the inner very long; hind femur with irregular rows anteriorly totalling 10 to 12 bristles; all tibiæ with usual preapicals, hind ones with small inner spur.

Abdomen pitchy black, except at the scutellar angles of the first segment; hypopygium not large, very hairy.

Size  $8\frac{1}{4}$  mm.

BRITISH E. AFRICA: Kenia Forest (*T. J. Anderson*, Imp. Bur. Ent.).

The following species are of the normal European form, with well-marked upper vertical patches and ocellar triangle, and with simple legs. Both belong to the section with long-haired arista and quite bare mesopleura.

*Helomyza balteata*, sp. n.

Head (top view):—Frons dullish orange and hairy, brighter and bare in narrow lines on each side of the ocellar triangle and along a mid line to the front; the upper vertical patches and the ocellar triangle sharply bounded, grey, the former with a pointed tip and only touching eyes just on vertex; hind head orange, with well-marked trapezoidal spot from neck to vertex; all bristles normal. Face smooth, orange. Side view:—Eyes rather elongate-oval, with the long axis in the line joining outer vertical to the protuberant mouth-angle; the latter is covered with a large dark patch, the rest of face &c. being orange; antenna orange, arista black, with long and strong pectination, stout slightly orange basal joints; long vibrissa with a small companion below; depth of jowl about equal to breadth of third joint; hind head orange and bristly. Palpi orange, with slightly infusate tip; tongue orange.

Thorax: dorsum almost uniformly dull ochreous brown, the tiny black bristles looking like a close regular punctation; a very faint pair of median lines between the d. c. bristles, which stand on brown spots; callus grey; scutellum as thorax, but a little paler centrally on disc and on the absolute tip, quite bare and flat, with a few tiny hairs between main bristles; pleura orange above, merging to yellow below, dull; mesopleura quite bare; metanotum dark, somewhat shining orange.

Wing with about nine stout spines from end of vein 1 to about level of hind cross-vein; suffused, the darkening being more intense from costa to just over second vein; both cross-

veins well and broadly suffused; veins brown. Halteres orange.

Legs: colour all orange, except that the hind knees and all the last tarsal joints are brown, and the tibiæ have tips browned. Bristles:—front femur with usual upper row and inferior hairs; mid femur with anterior row of 3 on distal third; hind femur with 5 bristles, three form an anterior superior row, the last of these and two others, one above the other, form a triangle; usual tibial preapicals.

Abdomen orange, each segment with a black band based on distal margin, narrow at side and broadening to middle, with rather indistinct boundary there, so that the appearance is like an indistinct mid-line with distinct side-teeth; genital segment orange, except extreme tip, which is black.

Size 7 mm.

S. RHODESIA: Chirinda Forest (G. A. K. Marshall, Camb. Coll.).

*Helomyza aspinosa*, sp. n.

This large species is quite aberrant, inasmuch as the characteristic costal spines are not to be seen; they are apparently so short as to merge in the general costal bristle-border, which is more strongly developed than usual. The venation is quite normal, as is the complete chætotaxy in every respect. In broad facies the insect is not quite typical of the genus, but looks rather like a *Dryomyzid*. The absence of costal bristles is even more marked than is apparently the case in the aberrant genus *Thyreophorella*, if one may judge by the figure of the same.

Head (top view):—All dull orange, darkened a little in front, black-haired, especially in front; the usual short hind eye-borders and conjoined ocellar triangle are somewhat paler, as is the hind head; the neck-spot is more orange and a little silvery. Face orange, a little darker over lip. Side-view:—All orange, including the antennal third joint (which is, however, brown on its absolute edge), arista (with very long hairs), the hairy palpi, and the tongue; a long vibrissa, with a few short neighbours below.

Thorax: dorsum dull reddish brown, a little darker in front and lighter on side from d. c. lines to pleura; two indistinct blackened lines run along the d. c. rows, with a similar indistinct line outside from about the level of cross-suture. Scutellum similar on the disc, which is quite flat and bare, with a few tiny hairs between the main bristles along the edge. Pleura (including callus and notopleura)

brightish orange, as are the sides of the scutellum and the metanotum; a darkened stripe runs from the end of the callus to the wing-base; the mesopleura is absolutely bare.

Wings quite normal, except as described above, somewhat suffused, especially costally; veins brown, more orange at base.

Legs normal. Colour: all yellow, except for tiny side-spots on the tips of middle and hind femora; front and hind tarsi with all joints suffused, middle with last joint black. Bristles: front femur with dorsal row of 6 and hairy below, middle femur with anterior row of 3 or 4, shaggy below, tibia with a crown and shaggy below; hind femur with superior row of 4 on distal half, rather haired below; all tibiae with usual preapical.

Abdomen pitchy black, with basal segment more orange, sides of all segments (except the last) and the venter orange, genital segment black; all segments with border-bristles, very long on the sides.

Size  $9\frac{1}{2}$ , wing  $8\frac{1}{2}$  mm.

S. RHODESIA: Chirinda Forest (*G. A. K. Marshall*, Camb. Coll.).

### Sciomyzidæ.

#### SEPEDON, Latr.

In the *Ann. Mus. Nat. Hong.* vol. ix. (1911) p. 266, Hendel published a paper on this genus, bringing the species from Asia and Africa up to date; since then only one species has been added. The paper is conservative in treatment, and clears up the confusion existent in the species as well as may be. No references are given here, as the above paper is used in what follows.

#### *Sepedon violaceus*, Hend.

INDIA: Coimbatore.

#### *Sepedon lobiferus*, Hend.

A nice series of this interesting form was in the Cam. Coll. under the name *javanicus*, R. D. The insect was hitherto only known from Formosa, and its occurrence in the Himalayan district is of interest.

INDIA: Showali, Kumaon.

There are two species in the Cam. Coll. from Africa. Speiser, in his paper on the Kilimandjaro-Meru Expedition (x. 5, pp. 168, 169), describes the species *trichooscelis* and *argyrostethus*; Hendel considers that the former is a synonym of *ornatifrons*, Adams, the latter most probably of *senegalensis*, Macq.; the author had independently come to the same conclusion. Both of Speiser's species were founded on single damaged specimens, and in the case of this genus that procedure is especially hazardous.

*Sepedon ornatifrons*, Adams.

A fair series is in the Camb. Coll., showing quite perceptible degrees of variation.

S. RHODESIA: Chirinda Forest (*G. A. K. Marshall*, Camb. Coll.).

*Sepedon senegalensis*, Macq.

NATAL: Durban (*F. Muir*, Camb. Coll.).

**Psilidæ.**

**CHYLIZA, Fall.**

There are two specimens from Ceylon which do not agree with any of the known Oriental species; in general appearance they are very like *C. leptogaster*.

*Chyliza pallidipes*, sp. n.

Head (top view):—The eye-borders black and somewhat shining, about  $\frac{1}{4}$  of total frontal width, extending from vertex nearly to front, but narrowing sharply in front; the wider part of the frons lying between these anterior narrowed parts is bright but dull yellow, the rest is brown ochreous, but the long ocellar triangle is a little shining and its base and the absolute vertex are rather shining orange; the whole head is covered with tiny golden pubescence; the bristles as in *C. leptogaster*, but stouter in proportion. Face yellow, but the lower half of the antennal pit is shining black; the narrow lower eye-margins slightly silvery. Side view:—Antenna with deep black basal joints and orange third, which is just perceptibly suffused on its edge; arista pale brown, with widely bipectinate flagellum, the total breadth of the pectination being about equal to the breadth of third; palpi deep black, tongue yellow. Hind head entirely shining

black above, black below, but widely bordered with yellow, so that hind jowls and mouth-margin are all that colour; eyes like *C. leptogaster*, with sinuate hind margin.

Thorax: dorsum subshining black, with uniform shallow minute shagreening; entirely covered with elegant pale yellow hairs, except for two lines, confluent in front and abbreviated about halfway, which are bare (these are best seen with oblique light); the dorsum is much like *leptogaster*. Pleura like the dorsum in front, but with silvery white hairs, longest below; the sclerites over the hind leg are all smooth, hairless, and very shining; just over the callus is a rather bright orange narrow bar, and a dark orange one is just visible on the top of the sternopleura. Scutellum all rather shining orange, bristled as in *leptogaster*.

Wings slightly smoky, especially broadly so at tip between costa and vein 4; the latter is parallel to 5 up to about its distal fifth, when it makes a sudden slight bend upwards; veins brown, extreme base of wing orange. Haltere with snow-white head and slightly brownish stalk.

Legs all pale straw-coloured, a little whiter proximally on the femora, with no sign of any rings or darkening.

Abdomen like the thorax in colour and punctuation, but the hairs are brownish; the shape is more wasp-like than in *leptogaster*.

Size 5 mm.

CEYLON: Peradeniya (*A. Rutherford*, Imp. Bur. Ent.).

### LOXOCERA, Mg.

In the Kilimandjaro-Meru Expedition Reports (x. 5, p. 193) Speiser gives a table of the known African members of this genus. Of these, *L. dispar*, Bezzi, is apparently quite distinct, having a black triangle, sternopleura, and front femora. He separates the others on the presence or absence of thoracic stripes and their position: thus, *L. rufa*, Loëw, is given as stripeless, *L. lateralis*, Lw., and *L. macrogramma*, Speiser, are striped in different ways.

In the Camb. Coll. are eleven specimens of a red *Loxocera* of the latter group. They are evidently closely related, and, apart from thoracic marks, differ only in the degree of undulation of the fourth vein between the cross-veins, and the angle between the last cross-vein and the fifth; in such cases where the veins are wavy or bent (as is the cross-vein here concerned) the angle in question and the amount of curvature of the veins is always a little uncertain. Apart from this and the colour of the thorax, neither of which are correlated



with one another nor with the sex, no structural difference is apparent. Now the thoracic dorsum varies greatly; of the seven males, one is clear red (typical *rufa*), one has side-lines just in front of the scutellum, one has side-lines complete but no middle one (this is typical *macrogramma* by comparison with Speiser's full description), one has side-lines and a faint middle one in front, one has all these lines well marked, one has all the lines broad and even confluent at the middle of the disc, and another has the lines reddish but a little dark behind. Of the four females, one is quite immaculate, one has only the faintest trace of the lines in red, one has the lines all present but faint, the last has all present and very strong. The author is quite sure that Speiser's *macrogramma* is a dark-lined form of *rufa*. As regards the two species of Loëw (*rufa* and *lateralis*), some doubt may arise. Loëw evidently had single specimens only (*rufa* is described from a ♀, *lateralis* from a ♂; see B. E. Z. 1874, xliv. p. 194). The main difference appears to be dark flecks in the antennal pits in the latter species and (possibly) less hairy arista. It is impossible to be sure of the true distinctness of these three species, and hence the author considers all the red *Loxoceras* with entirely black third joint to be *L. rufa*, Loëw.

S. RHODESIA: Salisbury and Chirinda Forest (G. A. K. Marshall, Camb. Coll.). NATAL: Durban (F. Muir, Camb. Coll.).

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XXI.—*Further Notes on the New Zealand Amphipod Hyale grenfelli*, Chilton. By CHAS. CHILTON, M.A., D.Sc., M.B., C.M., LL.D., C.M.Z.S., Professor of Biology, Canterbury College, New Zealand.

IN May 1916 \* I described a new species of Amphipod from New Zealand, naming it *Hyale grenfelli*. The type-specimen, which was the only specimen at that time known, was a male, and was characterized by the peculiar shape of the second gnathopod and by the great dilatation and setose character of the terminal joints of the maxillipeds. I pointed out that it was quite likely that this peculiar development of

\* Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. p. 362.

the maxillipeds would be found in the male only, and was probably to be looked upon as a secondary sexual character.

On December 12th, 1916, I received from Mr. C. R. Gow, of the Moko Hinou Lighthouse, a small collection of Crustacea which had been taken between tide-marks on Moko Hinou, a group of islands off the east coast of Auckland, situated about 50 miles from Cuvier Island, where the type-specimen was obtained. Among these Crustacea there are fortunately a few specimens of *Hyale grenfelli*. Most of these are males, showing the peculiar characters in the maxillipeds and the second gnathopod as described. One

Fig. 1.

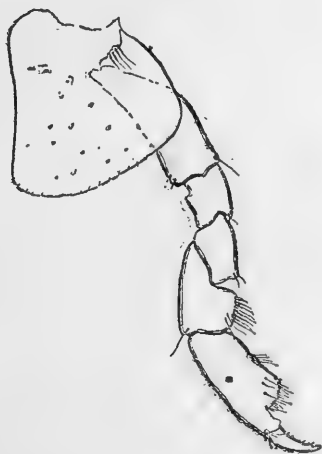


*Hyale grenfelli*, ♀. Maxillipeds.

specimen is a female, 5 mm. long, bearing five large eggs in the brood-pouch, and I am therefore now able to describe the characters of the female. In it the maxillipeds (fig. 1), though, perhaps, a little larger than in the majority of the species of *Hyale*, have the terminal joints only slightly enlarged, and not showing the special form nor the numerous long setæ characteristic of the male; the carpus bears one long seta at its outer distal angle and a few on the inner margin near the distal angle, but there are none on the surface of the joint itself; in the propod the inner margin

bears a regular row of long setæ and there are two rows on the surface near the outer distal end, lying more or less parallel to the distal border, and proximal to these there is one short row of four or five setæ and a single seta situated still more proximally; the dactyl is small, very much narrower than the propod, and bears at the end a long, stout, curved seta which is proportionately much more prominent than the corresponding seta on the dactyl of the male. It will be seen that the maxilliped in the female presents the ordinary characters common to allied species of *Hyale*, and that its terminal joints show none of the numerous transverse

Fig. 2.

*Hyale grenfelli*, ♀. First gnathopod.

rows of long fine setæ on the surface that are so characteristic of the male.

In the gnathopoda the first pair (fig. 2) are, on the whole, similar to those of the male, but more slender; the side-plate is large, produced a little anteriorly, so that it is widest below; the carpus bears a fringe of setæ on its posterior margin, as in the male, the propod is much more slender than the corresponding joint in the male, only widening very slightly distally, and its posterior border bears only a small tuft or short row of setæ near the centre instead of having nearly the whole of the margin fringed with a row of setæ as

in the male. The second gnathopod (fig. 3) is almost exactly the same as the first, but is very slightly larger, and the side-plate differs in being regularly rectangular and not widening below; the other joints of the appendage show no differences from the first worthy of notice.

In other characters the female closely resembles the male.

Nearly all the males are apparently fairly well developed, and show the characters of the second gnathopod and the maxillipeds nearly as originally described. In one which is

Fig. 3.



*Hyale grenfelli*, ♀. Second gnathopod.

about 5 mm. in length the terminal joints of the maxilliped are rather less expanded and not quite so setose, and in the second gnathopod the propod is not so wide, the palm is more oblique and much less concave, being nearly straight or only slightly concave, and its outer and inner borders are less widely separated; the dactyl, however, is short and fairly stout, almost as in the typical male. Doubtless in still younger specimens of the male these appendages would show the characters of the male to a still less extent and be more like those of the female.

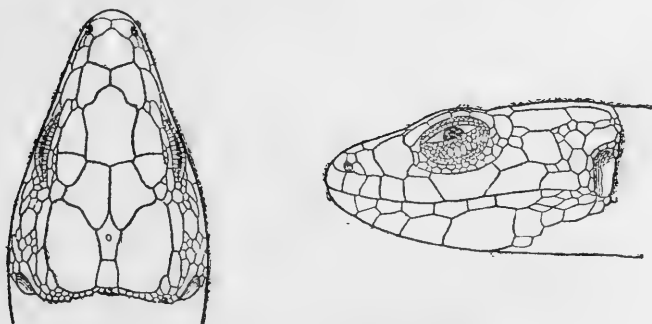
XXII.—*Descriptions of new Lizards of the Family Lacertidæ.*  
By G. A. BOULENGER, F.R.S.

(Published by permission of the Trustees of the British Museum.)

*Lacerta viridis*, var. *woosnami*.

Head comparatively short, its width  $1\frac{2}{5}$  to  $1\frac{1}{2}$  times in its length. Occipital  $\frac{1}{3}$  to  $\frac{3}{4}$  the length of the interparietal, not or but slightly broader than the latter; 2 to 8 granules between the supraoculars and the superciliaries; temple with 12 to 20 shields, with a large or very large masseteric, which may extend from the upper temporal to the upper labials,

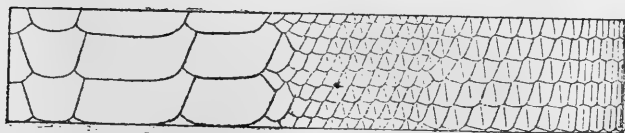
Fig. 1.



Upper and side views of head.

the tympanic well developed and usually in contact with the upper temporal. Dorsal scales rhombic and strongly keeled, considerably larger than the laterals; 38 to 43 scales across the middle of the body. Ventral plates in 6 longitudinal and 24 to 28 transverse series. 17 to 20 femoral pores on each

Fig. 2.



Lepidosis of middle of body.

side. 25 to 27 lamellar scales under the fourth toe. Green or olive-grey above, uniform or with small black spots, sparsely scattered on the back, more crowded on the sides, sometimes (in a single female) forming a regular vertebral series; upper surface of head uniform green, olive, or brown; lower parts yellow, greenish, but not blue, on the throat and on the sides of the belly. Young brown or olive, with three white longitudinal streaks on the back, traces of which may be preserved in the adult; black spots may be present between them; a white streak on each side of the neck, from the tympanum, continued on each side of the body or breaking up into two series of round spots; another white line along each side of the belly.

From snout to vent, ♂ 102 mm., ♀ 95; tail, ♂ 190, ♀ 207.

This form connects the var. *strigata* with the typical *L. viridis*, and especially the oriental specimens on which the name var. *vallanti*, Bedr., has been bestowed, agreeing with the latter in the temporal scutellation and the reduction in the number of superciliary granules, with the former in the presence of a light vertebral streak in the young; it differs from both in the lepidosis of the body, in respect to which it approaches *L. princeps*.

This variety is described from eight specimens obtained by the late Mr. R. B. Woosnam on the South Coast of the Caspian Sea, and from one young obtained by Mr. R. T. Günther at Bash Nurashin, N.W. Persia, which I had referred to the var. *strigata* (Journ. Linn. Soc. xxvii. 1899, p. 378).

#### *Ichnotropis tanganicana*.

Form and lepidosis as in *I. capensis*, Smith, but upper head-shields rather feebly striated and the four superciliaries in contact with the four supraoculars, only 3 or 4 small granules intervening between the second and third superciliaries and the supraoculars, and lower nasal but narrowly in contact with the rostral. 36 scales and plates round the middle of the body; ventral plates in 8 longitudinal and 25 transverse series. 11 or 12 femoral pores on each side. 19 lamellar scales under the fourth toe. Bronzy olive above, with a few small transverse blackish spots in three longitudinal series on the nape and two on the body; a black streak from the nostril to the eye, and another on the edge of the mouth; a white, black-edged streak from

below the eye, through the ear, to above the axil; white, black-edged ocellar spots on the posterior part of the back, on the hind limbs, and on the tail; lower parts white.

From snout to vent 38 mm.

This species, which I regard as the most primitive of the genus, as it is also the northernmost in its habitat, is based on a single male specimen, probably half-grown, from the East Coast of Lake Tanganyika, presented to the British Museum by Mr. W. H. Nutt in 1896.

*Eremias adramitana.*

Head and body strongly depressed, limbs very slender; head  $1\frac{1}{2}$  times as long as broad; snout pointed, with the nasal shields rather strongly swollen, as long as broad, as long as the postocular part of the head; hind limb reaching between the collar and the ear in males, the shoulder or the collar in females; foot  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times as long as the head; toes slender, feebly compressed; tail  $1\frac{3}{5}$  to  $2\frac{1}{2}$  times as long as head and body. Lower eyelid with a semi-transparent disk divided into 5 to 8 scales. Lepidosis as in *E. guttulata*, but occipital minute or absent, the parietals meeting in the middle, and ventral plates in 10 regular longitudinal series, mostly as long as broad or a little broader than long, the outer longer than broad. 31 to 40 scales across the middle of the body. 11 to 15 femoral pores on each side. Subdigital lamellæ tricarinate, 20 to 23 under the fourth toe. Fawn-coloured or pale grey above, with or without small brown spots, which may be irregular or disposed in two longitudinal series on the back, with or without small whitish spots; a dark brown lateral band, often bearing white spots, from behind the eye to the tail, bordered below by a white or yellowish lateral streak passing through the tympanum; upper surface of limbs marbled with brown, or with white spots; lower parts white.

From snout to vent 44 mm.

This species has been confounded with *E. brevirostris*, Blanf., of which the Syrian *E. bernoulli*, Schenkel, is a synonym, by Anderson, 'Herpetology of Arabia,' p. 43 (1896). It differs in the more depressed head, longer in proportion to its width, the more slender limbs, and the ventral plates constantly in ten longitudinal series. It is only known from the Hadramut, South Arabia, whilst *E. brevirostris* is on record from Kalabagh in the Punjab, Bushire in Persia, Tumb Island in the Persian Gulf, and Syria.

XXIII.—A new Bat of the Genus *Scotæcus*.

By OLDFIELD THOMAS.

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AMONG a series of well-prepared skins from Nyasaland presented to the National Museum by Mr. Rodney C. Wood, there occur examples of several rare bats, notably *Myotis welwitschii* and *hocagei*, *Glauconycteris papilio*, *Eptesicus megalurus*, and a *Scotæcus* which appears to be new. The last may be called

*Scotæcus woodi*, sp. n.

Near *S. albofuscus* of the Gambia, but smaller.

Size about the smallest of the genus. General colour above dark brown (near mummy-brown), the tips of the hairs paler brown; under surface little paler, near Prout's brown. Wings coloured as in *S. albofuscus*, the forearms, digits, hind limbs, and tail blackish, the membranes internal to a line from elbow to knee, and the interfemoral dark brown, those external to forearms dull whitish, rather darker terminally. Ears short, with large external basal lobe; tragus short and broad, its inner margin slightly concave.

Skull short and stumpy, of the characteristic broad shape usual in the genus, the lacrymal breadth even greater than in *S. albofuscus*. Nasal notch very deep. Median part of zygoma absent in type.

Incisors slender, their bases not touching the canines. Canines broadened transversely, their basal area broader than long, and flattened behind, close and parallel to the front edge of the large premolar; no small premolar or place for it present.

Dimensions of the type (the italicized measurements taken in the flesh):—

Forearm 28·5 mm.

*Head and body* 56 mm.; *tail* 27; *ear* 12.

Third finger, metacarpus 28, first phalanx 10, second phalanx 8; lower leg and hind foot (c. u.) 17·5.

Skull: greatest length 13·2; median upper length 11; basi-sinual length 9·8; greatest breadth 10·3; lacrymal breadth 6·7; mastoid breadth 9·1; palato-sinual length 4·5; front of canine to back of  $m^3$  4·9.

*Hab.* Southern Nyasaland. Type from Chiromo; alt. 200'.



*Type.* Adult male. B.M. no. 17. 2. 1. 1. Original number 173. Collected 2nd October, 1916, and presented by Rodney C. Wood, Esq.

This species may be distinguished from its only close, though geographically very distant, ally *S. albofuscus* by its smaller size, proportionally even broader skull, and the different shape of the base of its canines. The other members of the genus all have uniformly brown wing-membranes.

I may note that of twelve skulls of *Scotæcus*, including examples of all the described species, only two have complete zygomata, although all have been prepared by that most skilful skull-cleaner Mr. W. Sherrin. Imperfection or, at least, excessive tenuity of the zygoma would therefore appear to be an additional character of the genus *Scotæcus*. Of forty skulls of *Scoteinus* similarly prepared by Mr. Sherrin, nearly all have perfect, although very slender, zygomata.

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XXIV.—*A new Species of Aconæmys from Southern Chili.*  
By OLDFIELD THOMAS.

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THE British Museum has recently received from Mr. J. A. Wolffsohn a specimen of the rare genus *Aconæmys* (*Schizodon*, Waterh.) which had been presented to him by the well-known naturalist Don Carlos E. Porter. The species proving to be new, I propose to name it in honour of the latter, to whom the Museum has been indebted for help in various ways.

*Aconæmys porteri*, sp. n.

Fur more woolly than in *A. fuscus*; tail more completely bicolor; incisors stouter.

Size about as in *A. fuscus* or rather smaller. Fur soft, more woolly, less straight than in *A. fuscus*, the general texture and the colour both suggesting that of a European water-vole (*Arvicola amphibius*). General colour deep rich brown, near "auburn" of Ridgway, the subterminal rings on the hairs dull cinnamon. Under surface similar but rather warmer in tone, the ends of the hairs rich cinnamon. Hands and feet greyish white, the middle part of the metatarsus rather darker. Tail rather longer than in *A. fuscus* and completely bicolor, black above and creamy whitish below for

its whole length; in *A. fuscus* the terminal part of the under surface is brown.

Skull apparently somewhat smaller than in *A. fuscus*, but the age of the type is not very certainly determinable. Anterior part narrower, the breadth between the outer corners of the anteorbital foramina and the interorbital breadth both distinctly less.

Incisors very stout and heavy, decidedly thicker than in specimens of *A. fuscus* of apparently similar age.

Dimensions of the type:—

Tail (vertebræ in skin) 64; hind foot (dry) 28.

Skull: tip of nasals to back of frontals 28.5; greatest breadth 23; nasals  $15 \times 6.3$ ; interorbital breadth 7.5; breadth between outer corners of anteorbital foramina 17.6; palatilar length 16.2; front of incisors to back of  $m^3$  21.5; upper tooth-row (crowns) 8.4; combined breadth of upper incisors 4.7.

*Hab.* Osorno, S. Chili.

*Type.* Adult. B.M. no. 16. 11. 14. 4. Presented by Don Carlos E. Porter to Mr. J. A. Wolffsohn.

The British Museum contains eleven specimens of *Aconæmys fuscus*, received at different dates from Mr. T. Bridges, but whether all were from the "Valle de Las Cuevas, on the east side of the Andes, near the Volcano of Peteroa, altitude 6000'," where Mr. Bridges discovered the species, there is, unfortunately, no evidence to show. But all agree in the characters used above in separating the southern form, which is probably an inhabitant of the high slopes on the Volcano of Osorno, some little distance from the town of the same name.

Since the time of Mr. Bridges no examples of this genus have come to the British Museum, nor has our indefatigable correspondent Mr. Wolffsohn been able to see or hear of any. Consequently this additional specimen, representing a second and more southern species of the genus, is an extremely welcome accession.

## XXV.—*Descriptions and Records of Bees.*—LXXIV.

By T. D. A. COCKERELL, University of Colorado.

ALL the bees recorded in the present part are in the U.S. National Museum.

*Andrena lugubrescens*, n. n.

*Andrena lugubris*, Lepelletier, 1841 (not Erichson, 1840).

♂.—Belvidere, Tunis, May 10, 1899 (*P. Magretti*).

This is like the male of *A. albopunctata*, Rossi, but has the abdomen shining, irregularly wrinkled, and with scattered minute piliferous punctures, so it is doubtless the male of *A. lugubris*, described by Lepeletier from the female only.

Length about 12 mm.

Process of labrum prominent, shining, truncate, slightly emarginate; first recurrent nervure joining second submarginal cell distinctly before the middle.

The name *lugubris* is preoccupied, so *lugubrescens* is proposed as a substitute.

*Andrena cussariensis*, Morawitz.

♀.—Kohat, N.W. Provinces, India, March 1906 (*Frank Benton*).

Superficially this looks like *A. morio*, which Bingham records from the Simla hills; but it is certainly distinct from *morio*, and, as far as can be gathered from Morawitz's quite full description, agrees well with *cussariensis*. The abdomen has very fine punctures, and the process of labrum is much narrower than in *morio*. The species is more closely allied to *A. ephippium*.

*Andrena cussariensis kohatensis*, var. nov.

♀.—Length about 14.5 mm.

Scutellum and broad bands at sides of mesothorax terra-cotta red.

*Hab.* Kohat, India, March 1906 (*Frank Benton*).

This variety suggests comparison with *A. ephippium*, Spin., to which it is closely allied. It differs from *ephippium* by the narrower thorax, the scutellum much narrower, and less closely punctured on disc; the flagellum only very obscurely reddish beneath, the shorter fourth antennal joint, the less strongly sculptured area of metathorax, and the broad hind margin of first abdominal segment excessively finely punctured, abruptly contrasting with the rest of the segment. The hair of hind legs is entirely black.

Should comparison of specimens indicate that this species is to be separated from *A. cussariensis*, it may be known as *A. kohatensis*.

*Andrena chionospila*, sp. n.

♀.—Superficially exactly like *A. albopunctata*, Rossi (specimen from Ras-el-Ma, Algeria, compared), but differing thus:—Antennæ shorter; process of labrum, although very

broad, not so broad; area of metathorax smaller, less rugose; punctures of abdomen conspicuously more feeble and less dense; white hair-patches at sides of abdomen larger.

♂.—Very like the female, except in the usual sexual characters; head very broad; region of mouth, sides of face, and region of antennæ with long black hair, but face otherwise with long white hair, which is dull, not clear white as in ♀; cheeks broad, with black hair; abdomen less distinctly punctured.

*Hab.* Menserah, N.W. Provinces, India, March 1906 (*Frank Benton*).

Perhaps a subspecies of *A. albopunctata*.

*Andrena subspinigera*, sp. n.

♀.—Length about 11 mm.

Head, thorax, and legs black; abdomen with the first three segments clear ferruginous (the first with a broad transverse black band, the third with an interrupted suffused dark band beyond the middle), the others black, the third and fourth with heavy fringes of pure white hair, the second with a thin inconspicuous fringe, the caudal fimbria brownish black. Hair of head and thorax white, with a slight creamy tint on thorax above; facial foveæ rather narrow, seen from above shining white, with the upper end brown; facial quadrangle broader than long; process of labrum broad and obtuse, with sloping sides; clypeus dull except at sides, with sparse punctures; flagellum bright ferruginous beneath except at base; third antennal joint almost as long as next three together; mesothorax and scutellum dull, without well-defined punctures, the long hair not concealing the surface; area of metathorax dull, minutely granular, scarcely defined; tegulæ pale yellowish testaceous. Wings strongly reddened, stigma and nervures rufo-fuscous; b. n. meeting t.-m.; second s.m. large, receiving first r. n. considerably beyond middle. Scopa of hind tibiæ compact, fuscous behind (above), white in front; basitarsi broad and flat. Abdomen dull, minutely granular, without any evident punctures.

*Hab.* Menserah, N.W. Provinces, India, March 1906 (*Frank Benton*). On some labels the locality is written "Manserah," on others "Menserah."

This species is very like *A. spinigera*, Kirby, from Quetta, but differs by the flagellum red beneath, the dusky reddish wings, the dull abdomen, &c.

*Andrena quettensis*, sp. n.

♂.—Length about 9 mm.

Black, the hind tarsi, apical half of middle tarsi, broad apical band on first abdominal segment, and second segment except a spot on each side and a dusky cloud in middle (or only the apical margin and a broad semilunar area on each side basally) all ferruginous red. Head broad, facial quadrangle much broader than long; mandibles rather short, red at end; process of labrum broadly emarginate; no light face-marks; clypeus dull and granular; face and front covered with long sooty hair, paler and reddish about middle of face, becoming black around margins; occiput and lower part of cheeks with long pale fulvous hair; cheeks broad, but rounded behind; antennæ long, reaching metathorax; flagellum thick, crenulate, entirely dark; mesothorax and scutellum dull; area of metathorax triangular, coarsely wrinkled, poorly defined; hair of thorax long and fulvous; tegulæ fuscous, the outer margin paler. Wings long, reddish hyaline, stigma and nervures amber-colour; second s.m. receiving first r.n. well beyond middle. Legs with pale hair, golden on inner side of tarsi. Abdomen shining, the dark segments beyond the middle with a very slight, hardly observable, greenish tint; segments with very thin bands of long pale hair; apical plate broadly emarginate.

*Hab.* Quetta, India, March 1906 (*Frank Benton*).

This does not agree with any of the species reported by Nurse from Quetta; the nearest is *A. balucha*, Nurse, which has more red on the abdomen and much paler hair on head. It is just possible that *A. quettensis* represents an extreme colour-variation of *A. balucha*, but it seems to be quite distinct. In Apidæ Europææ *A. quettensis* runs to *A. cingulata* and *A. laticeps*, but differs at once by the colour of hair on head. *A. balucha*, which I have examined in U.S. National Museum, has the area of metathorax of the *Trach-andrena* type.

*Andrena bentoni*, sp. n.

♀.—Length about 9 mm.

Black, including legs and abdomen; hair of head and thorax abundant, erect, but not hiding surface, very pale greyish ochreous, black on vertex; facial quadrangle considerably broader than long; clypeus shining, strongly and closely punctured, without any distinct smooth line; mandibles red apically; process of labrum broadly truncate;

facial foveæ reddish brown, separated from eye by a distinct punctured band; flagellum obscure brownish beneath except at base; third antennal joint about as long as next three together; fourth and fifth short and about equal, sixth longer; mesothorax dull, closely and distinctly punctured; scutellum shining; area of metathorax granular, minutely plicate at extreme base; tegulæ fuscous, posteriorly ferruginous. Wings strongly reddened, stigma and nervures ferruginous; second s.m. receiving first r. n. in middle. Legs with pale hair, scopa of hind tibiæ dense, entirely pale golden fulvous. Abdomen broad and flattish, glistening, very finely and closely punctured, second segment depressed hardly one-fourth; hind margins of segments 2 to 5 with rather weakly developed white hair-bands; apical fimbria dark chocolate.

*Hab.* Menserah, N.W. Provinces, India, March 1906 (*Frank Benton*).

In Apidæ Europææ *A. bentoni* appears to fall nearest to *A. propinqua* and *A. separanda*, but the hair of thorax is quite differently coloured. There is no close resemblance to any of the Indian species.

*Andrena præcocella*, sp. n.

♂.—Length 7·5–8·5 mm.

Black, with long black and white hair. Very close to *A. præcox*, Scop., but differing thus:—Hind margins of second and third abdominal segments more or less brown or red; mandibles with no basal tooth beneath; head equally broad, but longer; upper part of cheeks punctured; light hair of thorax above white (not yellowish); fourth and fifth abdominal segments with thin white hair-bands; apical plate of abdomen emarginate, shaped like a fish-tail.

Compared with the Japanese *A. præcociformis*, Ckll., it differs by the large amount of black hair at sides of face, the cheeks strongly angled behind, the black hair on meta-thorax, &c.

*Hab.* Quetta, India, March 1906, 5 ♂ (*Frank Benton*).

The females of this group are very unlike the males, so I thought it possible that Nurse might have described the species from Quetta in the female sex. There is, however, no description which seems possibly applicable. In *A. præcocella* the fourth antennal joint is about 256 microns long, the fifth 320. The mandibles are long and falciform.

*Apis florea nasicana*, Cockerell.

Kohat, N.W. Provinces, India, March 1906 (*Frank Benton*).

*Tetralonia pomona* (Nurse).

Both sexes ; Quetta, India, March 1906 (*Frank Benton*).

*Tetralonia kohatensis*, sp. n.

♂.—Length 8·5–10 mm. ; antennæ about 6·5 mm.

Black, with the small joints of tarsi ferruginous ; clypeus, labrum, and basal half of mandibles clear sulphur-yellow ; mandibles red in middle and black apically ; antennæ long and slender, bright ferruginous beyond the third joint, the upper side dusky ; third antennal joint much longer than its apical width, dark fuscous, abruptly contrasting with fourth ; eyes green ; maxillary palpi rather short, but six-jointed ; head and thorax above, as well as front and upper part of face, with long pale fulvous hair, cheeks and underside of thorax with white hair ; disc of mesothorax shining ; tegulæ light reddish fulvous. Wings clear, faintly brownish in apical field ; stigma and nervures reddish fuscous ; first r. n. meeting second t.-c. or falling a little short of it ; marginal cell obliquely truncate. Outer side of tibiæ with dense white hair ; tarsi with ferruginous hair on inner side ; spurs creamy white. Abdomen shining, with piliferous punctures ; apical margin of segments broadly pallid, covered with dense bands of pale ochreous tomentum, of equal width right across, the band on first segment narrow ; no definable basal bands ; lateral margins of sixth segment briefly dentate.

*Hab.* Kohat, N.W. Provinces, India, 4 ♂, March 1906 (*Frank Benton*).

Related to *T. erythroceræ*, Cam., but easily separated by the fulvous hair. Superficially the insect is exactly like *Tetraloniella aliena*, Ckll.

*Anthophora connexiformis*, sp. n.

♂.—Length about 14 mm.

Robust ; black, including legs and antennæ (except a very small cream-coloured line on scape), with a short linear creamy mark on each orbital margin below level of antennæ, and a large cream-coloured area on clypeus, broad below, narrowed to a band above (inverse goblet-shaped), but labrum and mandibles wholly black ; eyes bright ochreous ; facial quadrangle much longer than broad ; mandibles with a large rounded tooth on inner side ; malar space well developed ; third antennal joint fully as long as next three united, the fourth very short ; clypeus, labrum, cheeks (except upper part anteriorly), and occiput densely covered

with very long pure white hair; front, vertex, sides of face, and upper part of cheeks anteriorly with black hair; thorax with very long hair, mixed grey and white, dark on scutellum, shining white on mesopleura; tegulæ black, very hairy. Wings hyaline. Legs slender, with long black and white hair, dark chocolate on inner side of tarsi; apical joint of middle tarsi with no noticeable fringe; hind basitarsus long and broadened. Abdomen not banded or spotted, but with a profusion of long erect hair, which is mostly greyish white, but black on discs of fourth and following segments, though white and very long at sides.

*Hab.* Quetta, India, March 1906 (*Frank Benton*).

Closely allied to *A. connexa* (Nurse), also from Quetta; but according to Nurse's description *connexa* has the clypeus all yellow, the apical tarsal joints more or less rufo-testaceous, the blackish hair of abdomen confined to the apical two segments, and the front with white hair. It thus seems probable that our insect is a distinct species, though it may be only a variety. There is a pencil of white hair on each side of front, a little above level of antennæ. The general appearance of the insect is very like that of *Tetralonia pomona*.

*Anthophora (Micranthophora) albopicta*, sp. n.

♀.—Length about 11 mm., anterior wing 8 mm.

Black, including the legs and antennæ, but mandibles ferruginous with the lower basal corner broadly black; labrum black, with a very broad white band down the middle; clypeus with a large apical white triangle, attenuated above, this on a light ferruginous field, which extends as a band to upper margin, but the upper half of clypeus black except in middle; eyes greyish ochreous, converging below, the front very broad; flagellum very obscurely reddish beneath; third antennal joint about 640 microns long, the next three together about 735; maxillary palpi with stout bristles, except on the last two joints; third joint of labial palpi 560 microns from base to origin of fourth joint; pubescence very pale ochreous, nearly white, long on head and thorax; on head and thorax above with black hairs intermixed; mesothorax extremely densely punctured; tegulæ piceous. Wings hyaline, with a very faint brownish tint. Legs with creamy white hair, rusty black on inner side of hind tibiæ and tarsi, anterior and middle tibiæ with a small patch of ferruginous hair at apex. Abdomen broad,



hind margins of segments whitish hyaline; whole surface of dorsal segments rather thinly covered with appressed pale hair, not forming bands; apex with a patch of black hair; apical plate very long and narrow.

*Hab.* Kotal Malul, S. Persia, Feb. 1906 (*Frank Benton*).

A typical *Micranthophora*, looking just like the Californian *A. anstrutheri*, Ckll., though differing in the face-markings and many other details. It is also related to the Indian *A. candida*, Sm., but the pubescence of the abdomen in that species is much more dense, the face-markings are different, and the flagellum is red beneath.

*Anthophora cincta* (Fabricius).

Axim, Gold Coast, Africa (*C. R. Mengel*).

*Anthophora antimena*, Saussure.

Mahanoro, Madagascar, May 5, 1895 (*W. L. Abbott*).

*Anthophora acraensis* (Fabricius).

Luebo, Congo (*D. W. Snyder*).

*Anthophora flavicollis*, Gerstaecker.

Axim, Gold Coast, Africa (*C. R. Mengel*).

*Anthophora leucorhina*, sp. n.

♂ (type).—Length about 15 mm.

Black, including flagellum and legs, except the reddish apical joint of tarsi; face-marks creamy white, including clypeus, labrum (except large black spot at each basal corner, and black apical margin), elongate spot on base of mandibles, narrow stripe along each anterior orbit (beginning at about level of antennæ, but not reaching lower corner of face), and anterior surface of scape; clypeus prominent, convex; third antennal joint about as long as next three combined; face and cheeks with long pure white hair, occiput with yellowish, vertex and front with black hair, but some white on each side of antennæ, and some long black hairs at sides of face; malar space well developed; thorax with abundant long hair, pale greyish-yellow above and on upper part of sides,

black on anterior part of scutellum, and white on lower part of pleura; mesothorax dull, slightly shining on disc; tegulæ piceous. Wings hyaline, very faintly brownish apically. Legs with long white hair; middle tarsi not modified, nor with any black fringe on last joint; hind basitarsi not toothed. Abdomen shining, with piliferous punctures, the surface covered with long hair, pale greyish-yellow on first two segments, black on the others, but hind margins of segments 2 to 4 with loose bands of white hair; venter with long white hair.

♀.—Length about 16 mm.

Tongue very long; no pale face-marks, but a red tubercle on each side of base of labrum, and malar space red; hair of front pale; disc of mesothorax and anterior part of scutellum with some dark hair, not conspicuous; tegulæ rufo-testaceous; patches of fulvous hair at apices of anterior and middle tibiae and on hind knees; hair on inner side of hind tibiae (except base) black, on inner side of hind tarsi largely red, in some lights appearing rich fox-red with black margin; abdomen with broad pale hair-bands on segments 2 to 4; apex with black hair; apical plate long and narrow; venter with white fringe on segments 2 to 4, but dense black hair on apex of 5.

*Hab.* Kotal Malul, S. Persia, Feb. 1906 (*Frank Benton*), 2 ♂, 1 ♀.

Resembles *A. cinerea* (Fries), from Sarepta, but is considerably larger. There is a general resemblance to *A. crinipes*, Sm., but the middle tarsi are not modified as in that species, and *crinipes* has a linear malar space. By the white face-marks and prominent clypeus the male resembles *A. dives*, Dours, of which I have a specimen marked "cotype" from Gribodo, but the legs are entirely different. Fries makes *dives* a synonym of *A. dufourii*, Lep., but it is possibly separable, the male (at least) having no metallic colour on abdomen, the middle tarsal joints of middle leg longer and slenderer than in Fries's figure, and the brush on last joint wider. They agree, however, in the remarkable hind basitarsi.

*Osmia* (*Ceratosmia*) *balucha*, Nurse.

Quetta, India, March 1906 (*Benton*).

The male has the middle femora strongly produced and angulate beneath, but the hind basitarsi are not dentate.

## BIBLIOGRAPHICAL NOTICE.

*Catalogue of the Lepidoptera Phalaenæ.* Supplement, Vol. I.  
London: the Trustees of the British Museum. 1914-15.

SINCE the publication of the first two volumes of the 'Catalogue of Moths' a formidable number of species in the families therein included have since been described. Hence it became necessary to prepare a supplement in order that the subject-matter of these volumes might be brought up to date. The present volume, with a smaller containing the plates, represents the first instalment of that supplement.

Some idea of the number of species which have been added to the lists may be gathered from Dr. Gahan's Preface to Sir George Hampson's work. Thus, the family Amatidæ in vol. i. contained 169 genera and 1184 species, to which are now added 16 genera and 945 species. The family Nolinae in vol. ii. had 13 genera and 162 species, to which are added 1 genus and 116 species; while the Lithosianæ in vol. ii. had 244 genera and 1055 species, to which are added in this Supplement 73 genera and 880 species! A supplementary volume to vol. iii. is in progress.

Whether all the species recognized in this Catalogue are really "good species" is evidently a matter for debate, since the author, in this Supplement, frequently admits of this or that new species that it is "very possibly" the male or female, or even a "variety," of some other specific form.

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## PROCEEDINGS OF LEARNED SOCIETIES.

### GEOLOGICAL SOCIETY.

December 6th, 1916.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

MR. G. C. CRICK, A.R.S.M., F.G.S., gave an account of some recent researches on the belemnite animal. He stated that it was not his intention to deal that evening with the homologies of the belemnite shell or with the phylogeny of the belemnite group, but to confine himself to the restoration of a typical belemnite animal and its shell, as shown particularly by examples in the British-Museum collection.

He first demonstrated, by means of a rough model, the construction of the belemnite shell, including the guard or rostrum, the phragmocone with its ventrally-situated siphuncle, and its thin envelope the conotheca, with its forward prolongation and expansion (on the dorsal side) known as the pro-ostracum. He then

exhibited photographic slides of examples in the British-Museum collection showing these various characters, and noted the abrupt termination of the chambered cone on the lower part of the pro-ostracum, of which the dorsal surface may have been partly or almost completely covered by a thin forward extension of the guard. To illustrate what was known of the complete body of the animal as found associated with the guard, he then showed photographic slides of two of the examples figured by Huxley in his 'Memoir on the Structure of the Belemnitidæ' published in 1864. Each of these exhibited the guard associated with portions of the pro-ostracum, the ink-bag, and the hooklets of the arms. The form of the hooklets with their thickened bases was discussed, this feature in a great measure justifying the attribution to the belemnite of certain cephalopod remains (found practically at about the same geological horizon) that included uncinated arms associated with an ink-bag, and frequently also with nacreous portions of (presumably) the pro-ostracum.

Of the remains of uncinated armed cephalopods from the Lias, each exhibiting the same form of hooklets as those figured by Huxley, he said that the British-Museum collection contained seventeen examples, all from the neighbourhood of Lyme Regis and of Charmouth, in Dorset. Each specimen exhibits a number of uncinated arms associated usually with an ink-bag, sometimes also with nacreous matter, and in two instances also with the guard or rostrum. These two examples were those to which he had already referred as having been figured by Huxley, and unfortunately the arms are not well preserved in either of these specimens; in one (*B. bruguierianus*, from the Lower Lias near Charmouth) there are only a few scattered hooklets, while the arms of the other (*B. elongatus*, from the Lower Lias of Charmouth) are represented only by a confused mass of hooklets. Of the other fifteen examples, in one there are a few solitary hooklets; in another the number of the arms is very indistinct; in two the remains of only two arms are preserved; in one there are traces of three arms; in two there are indications of three, or possibly four, arms; and in one there is a confused mass of possibly four arms; and in one there are the remains of four, or possibly of five, arms. In each of the remaining six specimens six arms can be more or less clearly made out, while there is not a single example in which more than six uncinated arms are displayed.

Of the six examples that exhibit six uncinated arms four are stated to be from the Lias of Lyme Regis; one is from the Lias of Charmouth; and one was obtained from the Lower Liassic shales between Charmouth and Lyme Regis. From a consideration of these specimens, the speaker concluded that the cephalopod represented by these uncinated arms is the animal known as the belemnite, and that the six uncinated arms were arranged in three pairs of unequal length, of which the longest pair was lateral, the medium-sized pair probably dorsal, and the shortest pair probably

ventral. He considered the presence of tentacular arms to be doubtful. These observations were in accord with those of Huxley, who, in his 'Memoir' already cited, stated that he had 'not been able to make out more than six or seven arms in any specimen, nor has any exhibited traces of elongated tentacula, though the shortness of the arms which have been preserved would have led one to suspect their existence.'

The speaker regarded certain markings sometimes to be seen on the guard as indicating that during the life of the animal the guard was almost, if not entirely, covered by the mantle, in which case it was highly improbable that the guard was pushed into the soft mud of the sea-bottom in order to act as an anchor.

He considered the animal to have been a free swimmer, swimming forward ordinarily, but when desirable, capable also of sudden and rapid propulsion backwards.

A short discussion followed, and the thanks of the Fellows present were accorded to Mr. Crick for his lecture.

December 20th, 1916.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

MARIE C. STOPES, D.Sc., Ph.D., gave an account of some recent researches on Mesozoic 'Cycads' (Bennettitales), dealing particularly with recently-discovered petrified remains which reveal their cellular tissues in microscopic preparations. To make the significance of the various fossil forms clear, Dr. Stopes first showed some lantern-slides of living Cycads, and then pointed out that it was in their external features and in their vegetative anatomy only that the fossil 'Cycads' were like the living forms; the most important features, the reproductive organs, differ profoundly in the two groups, and the fossils were fundamentally distinct, not only from the living Cycads, but from all other living or fossil families.

The fossils representing the group that are most frequently found are (*a*) trunks, generally more or less imperfect casts or partial petrifications, and sometimes excellent petrifications preserving anatomical details and cell-tissues; (*b*) impressions of the foliage. Not infrequent are the detached impressions of incomplete 'flowers' or cones, of one cohort (the Williamsoneæ), while petrified fructifications are numerous in some of the well-petrified trunks of the Bennettiteæ. The described species of the group run into hundreds, but probably many of these duplicate real species, because the foliage, trunks, pith-casts, various portions of the fructifications, etc., have often been separately found and named. In very few cases have the different parts been correlated. The species of the foliage are the most generally known, as they are the most readily recognized with the naked eye; they have been described under a variety of generic names.

The following table gives the proved, or probable, associated parts of some members of the group:—

Foliage.	Trunk.	Fructifications.
<i>Zamites</i> spp.	<i>Bennettites</i> spp.	<i>Bennettites</i> spp.
<i>Zamites gigas</i> .	Attached, no separate name.	<i>Williamsonia gigas</i> .
<i>Otozamites</i> sp.	.....	<i>Williamsonia spectabilis</i> .
<i>Ptilophyllum pectinoides</i> .	.....	<i>Williamsonia whitbiensis</i> .
<i>Anomozamites minor</i> .	(Only slender branches known, no name.)	<i>Wielandiella angustifolia</i> .
<i>Teniopteris vittata</i> .	.....	<i>Williamsoniella coronata</i> .

Dr. Stopes exhibited slides of microphotographs of the stem and leaf-base anatomy of the group, including some unpublished details of *Bennettites maximus*. The roots of the group have hitherto been entirely unknown, and a slide was exhibited for the first time showing rootlets penetrating the leaf-bases of a petrified specimen (represented by a section in the Geological Department of the British Museum—Natural History). These roots probably belong to *B. saxbyanus*: they are covered with wonderfully petrified root-hairs, running uncollapsed through the silica matrix. They raise interesting questions concerning the possible chemical conditions of the infiltration of the silica. Illustrations were also exhibited of the famous complex 'flower' and cone-structures, and of Wieland's brilliant restorations of the same. Microphotographic slides were exhibited of the seed-cone of an interesting unpublished new species from the British Gault. This is beautifully petrified, and adds to our knowledge of the finer anatomy of the seeds and associated structures. It is also the largest cone of the Bennettitales yet known, though it occurs in the Gault, by which time the group appears to have begun rapidly to die out.

The following table indicates the distribution of a few of the most interesting representatives of the Bennettitales (including the cohorts Bennettitæ and Williamsoniæ):—

UPPER CRETACEOUS.	Very fragmentary and uncertain records; apparently the group is nearly or quite extinct.	
MIDDLE CRETACEOUS;	The new large-sized seed-cone.	
Gault.	<i>B. morierei</i> ♀ (? described originally from the Jurassic).	
LOWER CRETACEOUS;	Well-petrified trunks with fructifications.	
Lower Greensand.	<i>B. gibsonianus</i> (type-species of the Bennettitæ).	
	<i>B. maximus</i> .	Throughout these periods in America, trunk-remains very abundant, often petrified and with fructifications, particularly from the Black Hills, South Dakota.
Potton Sands.	Trunks, e.g. <i>Colymbetes edwardsi</i> .	
Wealden.	Trunks (casts and petrifications), foliage.	
	<i>B. saxbyanus</i> .	
JURASSIC; Purbeck.	Trunks (casts and semi-petrifications).	
	Buckland's original <i>Cycadeoidea</i> spp.	
	<i>C. gigantea</i> .	

Oolites.	Trunks, pith-casts, etc. Much foliage of various types. <i>Williamsonia gigas</i> and other fruit-impressions.	} and Maryland. <i>C. jenneyana</i> , <i>C. ingens</i> , <i>C. wielandi</i> , etc.
	<i>W. scotica</i> .	
	<i>Williamsoniella coronata</i> .	} Rich impressions in Mexico of <i>Williamsonia</i> and many foliage genera.
Lias.	Foliage and <i>Williamsonia</i> fruits (India).	
Rhætic.	<i>Wielandiella angustifolia</i> and foliage.	

The group is by far the most characteristic of all the plants of the Jurassic and Lower Cretaceous, during which periods its distribution was almost world-wide. It was locally, if not universally, dominant, and was the most highly evolved plant-group of the epoch of which we are cognizant.

Three chief points of interest are to be noted in the geological distribution of these plants: (*a*) that the most numerous highly-specialized trunks reach their maximum in the Jurassic and Lower Cretaceous Periods, when their distribution was practically world-wide; (*b*) that the oldest and therefore presumably the most primitive type, *Wielandiella*, is externally less like the living cycads than the commoner later forms, while these latter are utterly unlike the living genera in their fructifications; (*c*) that the geologically youngest cone is the largest yet discovered, occurring in the Gault when the extinction of the group appears already to have set in.

Contrary to what might have been anticipated from their external likeness to the living Cycads, coupled with their great geological age, the fossil 'Cycads' are much more complex and on a higher level of evolution than the living group. It seems to the Author to be extremely unlikely that the fossil and the living forms have any direct phylogenetic connexion nearer than a remote, unknown, common ancestor. The mooted connexion between the fossil 'Cycads' and the Angiosperms is highly suggestive, but lacks data for its establishment.

A short discussion followed, and the thanks of the Fellows present were accorded to Dr. Stopes for her lecture.

January 10th, 1917.—Dr. Alfred Harker, F.R.S., President, in the Chair.

The following communication was read:—

'Balston Expedition to Peru: Report on Graptolites collected by Capt. J. A. Douglas, R.E., F.G.S.' By Charles Lapworth, LL.D., M.Sc., F.R.S., F.G.S.

The specimens of graptolites were collected from the rocks of the Inambari district in Peru by Capt. Douglas, under whose name

the collection has been placed in the Geological Department of the University Museum, Oxford. These fossils were forwarded by Prof. W. J. Sollas to Prof. C. Lapworth, who embodied the results of his study in a Report, of which the following is a brief abstract.

The specimens are recorded as all occurring in the same locality, but it is not known whether they were obtained from a single zone. The majority of the rock-specimens in which the graptolites occur are black and somewhat pyritous carbonaceous shales, usually well bedded and uncleaved, and the graptolites are in general well preserved. The lithology of the containing rocks and the mode of preservation of the graptolites are similar to those obtaining in the richest graptolite-bearing strata of Britain, Europe, and North America.

The forms apparently represented in the collection are *Loganograptus logani* Hall, a new species of *Goniograptus* (?), *Didymograptus stabilis* Elles & Wood and *D. bifidus* Hall, *Phyllograptus angustifolius* Hall, *Glossograptus acanthus* Elles & Wood, *Cryptograptus tricornis* Hall, var., *Amplexograptus confertus* Lapworth, and *A. cælatus* Lapworth.

Taken as a whole, this graptolite fauna may best be compared with that of the Upper Arenig formation of Britain and its North-American equivalents, answering to the Lower Llanvirnian of Hicks & Marr and the *Didymograptus-bifidus* Zone of Elles & Wood and H.M. Geological Survey.

The assemblage of graptolites discovered in Bolivia a few years ago by Dr. J. W. Evans corresponds very closely with this Peruvian fauna, and was probably derived from the southward continuation of the same Andean graptolite-band. The Peruvian forms in the Douglas collection, like those from Bolivia, admit almost as close a parallelism with those of the Arenig-Llandeilo graptolite-beds of Australia and New Zealand as with their representatives in the Northern Hemisphere.

Not only is the Douglas Collection of Peruvian graptolites instructive and valuable from the palæontological point of view, owing to the number and the good state of preservation of the species represented, but it is of especial interest from the palæogeographical aspect, as affording additional proof of the identity (in general facies) of the graptolite fauna of the sea-waters of Lower Ordovician times in those regions of the globe which are now occupied by some of the dry lands of Britain, Eastern North America, Peru, Bolivia, Victoria, and New Zealand. Thus it greatly strengthens the inference that in Arenig-Llandeilo times there was open-sea communication admitting of the circulation of sea-currents along some as yet undetermined line or lines, connecting the above-mentioned regions, which must have extended across the Equator and apparently throughout a length nearly equal to that of half the circumference of the globe.



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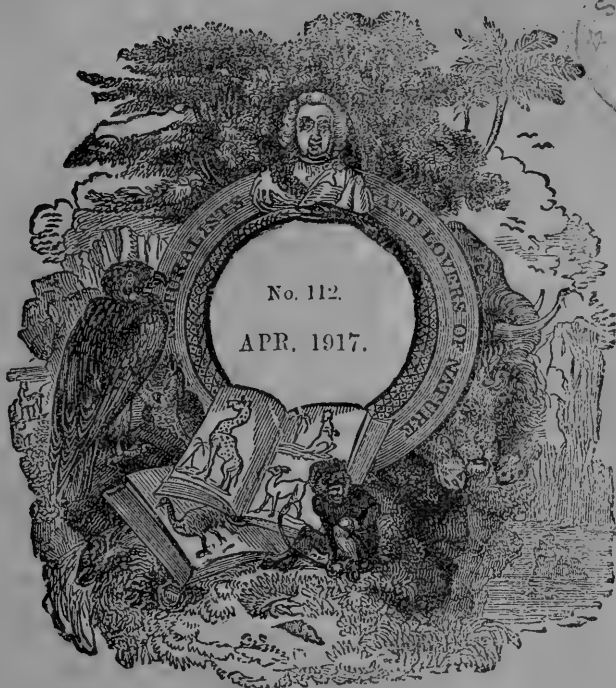
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# THE ANNALS

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## MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 112. APRIL 1917.

XXVI.—*A Revision of the Clupeoid Fishes of the Genera Pomolobus, Brevoortia and Dorosoma, and their Allies.*  
By C. TATE REGAN, M.A.

(Published by permission of the Trustees of the British Museum.)

THE genera dealt with in this revision are the Clupeinæ with a distinct notch in the middle of the upper jaw ; these have usually been placed in two distinct groups—those with terminal mouth and the last dorsal ray not prolonged being associated with *Clupea*, and the others, with inferior mouth or last dorsal ray prolonged, forming a group apart (Chatoessinæ of Günther, Dorosomatidæ of modern authors) ; in my judgment this is quite an artificial arrangement. All these fishes appear either to be migratory, entering rivers to spawn in fresh or brackish water\*, or are permanently fluviatile (e. g., *Gudusia*, *Signalosa*).

### *Synopsis of the Genera.*

I. Gill-rakers of epibranchial of first arch folding downwards, those near the angle overlapping the gill-rakers of the ceratobranchial.

A. Scales with edges entire or feebly serrated ; normal scales from occiput to dorsal fin ; pelvic fins 9-rayed ; operculum with radiating grooves.

Teeth on vomer and palatines (rarely deciduous in adults).....

1. *Caspialosa*.

\* The breeding-habits of *Ethmidium* and *Ethmalosa* are unknown to me.

- Palate toothless; lower jaw not prominent, its tip included ..... 2. *Alosa*.
- Palate toothless; lower jaw projecting ..... 3. *Pomolobus*.
- B. Scales with edges serrated in young, pectinated in adults; pelvic fins 7-rayed.
- A well-defined series of pectinated scales on each side of middle line from occiput to dorsal fin; operculum striated or nearly smooth .. 4. *Brevoortia*.
- A median series of scutes from occiput to dorsal fin; operculum smooth or very feebly striated. 5. *Ethmidium*.
- II. Gill-rakers of epibranchial of first arch not folding downwards over those of ceratobranchial; pelvic fins 8-rayed; operculum smooth.
- A. Edge of dentary not reflected outwards in front of maxillary.
1. Last dorsal ray not prolonged.
- Upper gill-rakers of first and second arches and all of succeeding arches bent or expanded, T-shaped or triangular in section ..... 6. *Ethmalosa*.
- Gill-rakers normal: scales large, 40-50/13-20 .. 7. *Hilsa*.
- Gill-rakers normal; scales small, 75-100/27-34 . 8. *Gudusia*.
2. Last dorsal ray prolonged into a filament.
- Mouth terminal or subterminal; maxillary normal, with one supramaxillary ..... 9. *Clupanodon*.
- Mouth terminal; maxillary normal, with two supramaxillaries ..... 10. *Signalosa*.
- Mouth subterminal or inferior; maxillary slender, with one supramaxillary ..... 11. *Dorosoma*.
- B. Edge of dentary reflected outwards in front of extremity of maxillary; mouth toothless, subterminal or inferior, transverse, its cleft forming an angle; one supramaxillary.
- Maxillary slender, distally slightly expanded and curved downwards; last dorsal ray produced into a filament ..... 12. *Nematalosa*.
- Maxillary slender, distally slightly expanded and curved downwards; last dorsal ray not produced ..... 13. *Gonialosa*.
- Maxillary a straight, thin, transversely expanded lamina, tapering distally; last dorsal ray not produced ..... 14. *Anodontostoma*.

### 1. CASPIALOSA, Berg, 1915.

*Clupeonella* (non Kessler), Berg, Ann. & Mag. Nat. Hist. (8) xi. 1913, p. 472.

*Caspialosa*, Berg, Poiss. de l'eau douce de la Russie, p. 22 (1916).

Differs from *Alosa* in having three patches of teeth on the palate, borne by the vomer and palatine bones; but in large examples of *C. caspia* I find that the palate is toothless.

Black and Caspian Seas.

Berg recognizes thirteen species of this genus.

## 2. *ALOSA*, Cuv. 1829.

Règne Animal, ed. 2, ii. p. 319; Regan, Ann. & Mag. Nat. Hist. (8) xviii. 1916, p. 6.

North Atlantic and Mediterranean.

In my revision five species and six subspecies were recognized.

## 3. *POMOLOBUS*, Rafin. 1820.

Ichth. Ohiensis, p. 33; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 424.

Distinguished from *Alosa* by the prominent lower jaw, with its tip not included.

Western North Atlantic.

### *Synopsis of the Species.*

I. Lower jaw strongly projecting; 20 to 25 gill-rakers on lower part of anterior arch.

Anterior teeth persistent; maxillary extending to below posterior part of eye; caudal peduncle longer than deep . . . . .

1. *chrysochloris*.

Jaws toothless; maxillary extending to below middle of eye; caudal peduncle as long as deep. . . . .

2. *mediocris*.

II. Lower jaw a little projecting; 40 to 50 gill-rakers on lower part of anterior arch.

Depth  $3\frac{1}{2}$ , head  $4\frac{2}{3}$  in the length; eye  $4\frac{1}{2}$  to 5 in head (in specimens of 220–260 mm.) . . . . .

3. *æstivalis*.

Depth 3, head 4 to  $4\frac{1}{2}$  in the length; eye  $3\frac{1}{2}$  to 4 in head (in specimens of 220–260 mm.) . . . . .

4. *pseudoharengus*.

### 1. *Pomolobus chrysochloris*.

*Pomolobus chrysochloris* (Rafin. 1820), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 425, and 1900, fig. 187.

Depth of body  $3\frac{3}{4}$  in the length, length of head 4. Snout longer than diameter of eye, which is 6 in length of head; maxillary extending to below posterior part of eye; lower jaw strongly projecting; small conical teeth persistent in præmaxillaries and anterior part of lower jaw; 23 gill-rakers on lower part of anterior arch. 56 scales in a longitudinal series, 17 in a transverse series; ventral scutes 21+15. Dorsal 18. Anal 18. Pelvics a little in advance of middle of dorsal. Caudal peduncle longer than deep. Silvery; back darker.

Mississippi and southern coast of U.S.A.

A single specimen, 280 mm. long, from Pensacola.

2. *Pomolobus mediocris*.

*Pomolobus mediocris* (Mitchill, 1815), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 425, and 1900, fig. 188.

Depth of body  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in the length, length of head 4 to  $4\frac{1}{4}$ . Snout longer than diameter of eye, which is 5 in length of head; maxillary extending to below middle of eye or a little beyond; lower jaw strongly projecting; jaws toothless; 21 or 22 gill-rakers on lower part of anterior arch. 56 scales in a longitudinal series, 17 in a transverse series; ventral scutes 21-22+16. Dorsal 16-18. Anal 20-22. Pelvics in advance of middle of dorsal. Caudal peduncle as long as deep. Silvery; back darker; each scale on sides with a dark spot.

Atlantic coast of U.S.A.

Three specimens, 280 to 300 mm. long, from the Potomac and Woods Hole.

3. *Pomolobus æstivalis*.

*Pomolobus æstivalis* (Mitchill, 1815), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 426, and 1900, fig. 190.

Depth of body  $3\frac{1}{2}$  in the length, length of head  $4\frac{2}{3}$ . Snout a little longer than diameter of eye, which is  $4\frac{1}{2}$  to 5 in the length of head; maxillary extending to below anterior part or middle of eye; lower jaw a little projecting; jaws toothless; 44 to 47 gill-rakers on lower part of anterior arch. 52 to 55 scales in a longitudinal series, 15 or 16 in a transverse series; ventral scutes 20+14. Dorsal 17-18. Anal 18-20. Pelvics below anterior half of dorsal. Caudal peduncle longer than deep. Silvery; back darker.

Atlantic coast of U.S.A.

Two specimens, 220 and 260 mm. in total length.

4. *Pomolobus pseudoharengus*.

*Pomolobus pseudoharengus* (Wilson, c. 1811), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 426, and 1900, fig. 189.

Depth of body 3 in the length, length of head 4 to  $4\frac{1}{2}$ . Snout as long as or shorter than diameter of eye, which is  $3\frac{1}{2}$  to 4 in the length of head; maxillary extending to below middle of eye or a little beyond; lower jaw a little projecting; jaws toothless; 40 to 42 gill-rakers on lower part of anterior arch. 52 to 56 scales in a longitudinal series, 15 to 17 in a transverse series; ventral scutes 20-21+12-14.



Dorsal 16-18. Anal 18-22. Pelvics below anterior half of dorsal. Caudal peduncle as long as deep, or deeper than long. Silvery; back darker.

Atlantic coast of U.S.A.

Seven specimens, 220 to 260 mm. in total length.

#### 4. BREVOORTIA, Gill, 1861.

Proc. Ac. Philadelphia, p. 37; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 433.

This genus is distinguished from *Alosa* by the pectinated scales. The gill-rakers are very numerous, long and slender.

##### 1. *Brevoortia tyrannus*.

*Clupea tyrannus*, Latrobe, Trans. Amer. Phil. Soc. v. 1872, p. 77, pl. i.

*Clupanodon aureus*, Agassiz, Spix, Pisc. Brasil. p. 52, pl. xxi. (1828).

*Clupea menhaden* (Mitchill, 1815), Günth. Cat. Fish. vii. p. 436 (1878).

*Clupea aurea*, Günth. t. c. p. 437.

*Brevoortia tyrannus*, Goode, Rep. U.S. Fish. Comm. 1877, p. 19, pls. i., ii. (1879); Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 433.

*Brevoortia patronus*, Goode, t. c. p. 26, pl. v.

Depth of body  $2\frac{1}{2}$  to  $3\frac{1}{3}$  in the length, length of head  $2\frac{4}{5}$  to  $3\frac{1}{5}$ . About 70 gill-rakers (in the adult) on ceratobranchial of first arch. About 50 scales in a longitudinal and 25 in a transverse series; in adults scales very deep, two often meeting across one of the intermediate longitudinal series, thus increasing the number of transverse rows; ventral scutes 18-20 + 11-12. Dorsal 18-21. Anal 19-24. Pelvics below or in advance of anterior rays of dorsal. Vertebrae 48.

Nova Scotia to Gulf of Mexico and Brazil.

Several examples up to 350 mm. in total length; one of these, from Alabama, and therefore *B. patronus*, is exactly similar to the specimen 8 inches long, from Woods Hole, figured by Goode. Günther's example named *Clupea aurea* is without locality, and may be North American; the distribution of this species on the coast of South America has yet to be made out.

##### 2. *Brevoortia pectinata*.

*Alosa pectinata*, Jenyns, Zool. 'Beagle,' Fish. p. 135, pl. xxv. (1842).

*Clupea pectinata*, Günth. Cat. Fish. vii. p. 437 (1868).

*Brevoortia pectinata*, Goode, Rep. U.S. Fish. Comm. 1877, p. 30, pl. vi. (1879).

Depth of body  $2\frac{1}{3}$  to  $2\frac{2}{3}$  in the length; length of head 3 to  $3\frac{1}{2}$ . Gill-rakers more numerous than in *B. tyrannus*, about

90 on ceratobranchial of first arch. Scales more regularly arranged and not so deep as in *B. tyrannus*; about 48 in a longitudinal series, 20 to 25 in a transverse series; ventral scutes 18-20+10-12. Dorsal 17-19. Anal 18-22. Pelvics below or in advance of origin of dorsal. Vertebrae 44.

Northern Patagonia to Southern Brazil.

Here described from the types, skins, 180 and 260 mm. in length (the larger kindly sent to me for examination by C. Forster Cooper, Esq.), and from four examples of 220 mm. from Rio Grande do Sul.

### 5. ETHMIDIUM, Thompson, 1916.

Proc. U.S. Nat. Mus. l. p. 458.

Closely related to *Brevoortia*, but with a median series of scutes from occiput to dorsal fin.

#### *Ethmidium maculatum*.

*Alausa maculata*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 430 (1847).

*Alausa caerulea*, Cuv. & Val. t. c. p. 432.

*Clupea notacanthus*, Günth. Cat. Fish. vii. p. 443 (1868).

*Clupea maculata*, Günth. l. c.

*Clupea (Alosa) notacanthoides*, Steind. Sitzungsab. Akad. Wien, lx. 1869, p. 309, pl. vii.

*Ethmidium notacanthoides*, Thompson, Proc. U.S. Nat. Mus. l. 1916, p. 458.

*Ethmidium caerulea*, Thompson, t. c. p. 460.

Depth of body in the adult equal to length of head, 3 in length of fish; in the young head relatively shorter and body deeper. Diameter of eye 4 to 7 in length of head; maxillary extending to below posterior part of eye or beyond. 80 (young) to 160 (adult) gill-rakers on lower part of anterior arch. 24 to 28 scutes from occiput to dorsal fin; about 50 scales in a longitudinal, 17 to 20 in a transverse series; ventral scutes 18-20+15-17. Dorsal 19-22. Anal 14-18. Pelvics below anterior  $\frac{1}{2}$  of dorsal. Vertebrae 50. Silvery; back bluish; sometimes a lateral series of dark spots.

Peru and Chile.

Four specimens, 100-280 mm. long, from Callao, Valparaíso, and Helladura Bay.

### 6. ETHMALOSA, gen. nov.

Form rather deep and strongly compressed. Upper jaw with median notch; lower jaw included; teeth minute or absent. Adipose eyelid well developed; cheek moderately deep, with a naked area below the suborbitals. Operculum

smooth except for a groove parallel to its anterior edge; suboperculum tapering upwards; opercular margin rounded; 6 branchiostegals. Lower gill-rakers of first and second arches long, slender, and numerous, those of ceratobranchial folding over those of epibranchial, which are curiously expanded, T-shaped or triangular in section, appearing angularly bent on the lower side, but not on the upper; gill-rakers of third and fourth arches similarly expanded or recurved, the series fitting closely to form a sieve. About 45 scales in a longitudinal and 16 to 19 in a transverse series; edges of scales crenulated in the young, pectinated in the adult; transverse grooves paired, not meeting in the middle of the scale, only the most posterior groove extending right across; a well-defined mid-dorsal double row of scales, commencing with a large postoccipital pair, extends backwards to the dorsal fin; ventral scutes with sharp-pointed keels. Dorsal fin of 16 to 19 rays; a very low basal sheath. Anal of 20 to 23 rays. Pelvics 8-rayed, inserted below anterior  $\frac{1}{2}$  of dorsal. Caudal with alar scales.

*Ethmalosa dorsalis*.

*Meletta senegalensis*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 370 (1847).

*Aloosa dorsalis*, Cuv. & Val. t. c. p. 418.

*Aloosa platycephalus*, Bleek. Verh. Holl. Maatsch. Haarlem, 1862, Guinée, p. 123, pl. xxvi. fig. 2.

*Clupea dorsalis*, Günth. Cat. Fish. vii. p. 438 (1868).

*Clupea setosa*, Steind. Sitzungsab. Akad. Wien, lx. 1869, p. 311, pl. vi.

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head 3 to  $3\frac{2}{5}$ . Diameter of eye  $4\frac{1}{2}$  to 6 in length of head. Maxillary extending to below middle or posterior part of eye. About 45 scales in a longitudinal, 16 to 19 in a transverse series; ventral scutes 16-19+11-13. Dorsal 16-19. Anal 20-23. Pelvics below anterior  $\frac{1}{2}$  of dorsal. Silvery; back darker; tip of dorsal fin blackish.

West Africa.

Numerous examples up to 300 mm. in total length.

7. HILSA, gen. nov.

*Paralosa* (non Bleek.), Regan, Ann. Durban Mus. i. 1916, p. 167.

Distinguished from *Aloosa* by the smooth operculum and the different arrangement of the gill-rakers of the anterior arch, from *Ethmalosa* by the normal structure of the gill-rakers, and from both by the absence of alar scales on the caudal fin.

Coasts and rivers from Natal to China.

In the young the body is deeper and the head smaller than in the adults, the greater length of the head in the latter being mainly due to the size of the operculum.

### *Synopsis of the Species.*

#### I. Parietal ridges expanded and striated.

##### A. Depth $2\frac{1}{2}$ to 3 in the length.

Head 3 to  $3\frac{2}{5}$  in the length ..... 1. *kanagurta*.

Head  $3\frac{2}{5}$  to  $3\frac{3}{4}$  in the length ..... 2. *durbunensis*.

B. Depth  $2\frac{1}{4}$  in the length ..... 3. *brachysoma*.

#### II. Parietal ridges narrow, covered by smooth skin.

##### A. Maxillary extending to below middle of eye (young) or beyond.

##### 1. Caudal lobes as long as head.

Operculum  $\frac{1}{2}$  to  $\frac{2}{3}$  as broad as deep; scales 45-48/17-20. 4. *ilisha*.

Operculum  $\frac{2}{3}$  to  $\frac{3}{4}$  as broad as deep; scales 42-45/16-17. 5. *reevesi*.

##### 2. Caudal lobes longer than head.

Operculum  $\frac{1}{2}$  to  $\frac{2}{3}$  as broad as deep; scales 40/14-15 .. 6. *toli*.

B. Maxillary not reaching middle of eye; caudal lobes much longer than head; scales 45/14-15..... 7. *macrura*.

### 1. *Hilsa kanagurta*.

*Alosa kanagurta*, Bleek. Verh. Bat. Gen. xxiv. 1852, Haringacht. p. 34; Atl. Ichth. vi. p. 114, Clup. pl. vii. fig. 5 (1872).

*Alosa malayana*, Bleek. Ned. Tijdschr. Dierk. iii. 1866, p. 294; Atl. Ichth. vi. p. 114, Clup. pl. vii. fig. 4.

*Clupea ilisha*, Günth. Cat. Fish. vii. p. 445 (1868).

*Clupea kanagurta*, Day, Fish. India, p. 640, pl. clxii. fig. 4; Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 67 (1913).

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head 3 to  $3\frac{2}{5}$ . Parietal ridges expanded and striated. Snout nearly as long as or a little longer than diameter of eye, which is  $3\frac{2}{3}$  to  $4\frac{1}{2}$  in length of head; maxillary extending to below middle or posterior part of eye; width of operculum  $\frac{1}{2}$  or less than  $\frac{1}{2}$  its depth; 100 to 150 gill-rakers on lower part of anterior arch. 42 to 45 scales in a longitudinal series, 13 or 14 in a transverse series; ventral scutes 16-18+11-13. Dorsal 17-20. Anal 19-22. Pelvics below anterior half of dorsal. Caudal about as long as head. A dark humeral spot, in the young followed by a series.

Zanzibar to Malay Archipelago.

Fifteen examples, up to 220 mm. in total length.

2. *Hilsa durbanensis*.

*Clupea durbanensis*, Regan, Ann. Natal Govt. Mus. i. 1906, p. 4, pl. iv.; Gilchrist, S. Afr. Mar. Biol. Rep. i. 1913, p. 59.

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head  $3\frac{3}{5}$  to  $3\frac{3}{4}$ . Parietal ridges expanded and striated. Snout as long as or slightly longer than diameter of eye, which is 4 to  $4\frac{1}{2}$  in length of head; maxillary extending to below middle or posterior part of eye; width of operculum  $\frac{2}{5}$  its depth; 150 gill-rakers on lower part of anterior arch. 42 to 44 scales in a longitudinal, 13 or 14 in a transverse series; ventral scutes 16-17+12-13. Dorsal 17-18. Anal 19-21. Pelvics below anterior half of dorsal. Caudal fin about as long as head. A dark humeral spot. Upper edge of dorsal and posterior edge of caudal blackish.

Natal.

Three specimens from Durban, 140 to 200 mm. in total length.

Gilchrist has examined a large example, 240 mm. long to base of caudal fin; in this the head is  $3\frac{2}{5}$  in the length, and there are 200 gill-rakers on the lower part of the anterior arch.

3. *Hilsa brachysoma*.

? *Alosa brevis*, Bleek. J. Ind. Arch. ii. no. 9, 1848, p. 638; Atl. Ichth. vi. p. 116 (1872).

*Alosa brachysoma*, Bleek. Nat. Tijdschr. Ned. Ind. v. 1853, p. 527; Atl. Ichth. vi. p. 115, Clup. pl. iv. fig. 5 (1872).

*Clupea platygaster*, Günth. Cat. Fish. vii. p. 448 (1868); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 66, fig. 24 (1913).

Depth of body  $2\frac{1}{4}$  in the length, length of head  $3\frac{2}{5}$ . Parietal ridges expanded and striated. Snout as long as diameter of eye, which is 4 in length of head; maxillary extending beyond middle of eye; width of operculum  $\frac{2}{5}$  its depth; 100 gill-rakers on lower part of anterior arch. 42 scales in a longitudinal, 15 in a transverse series; ventral scutes 17+12. Dorsal 17-18. Anal 20-21. Pelvics below middle of dorsal. Caudal about as long as head. A dark humeral spot; dorsal and caudal dark-edged.

Sumatra.

Here described from Bleeker's type and only specimen, which has the head and body deeper and the lower jaw longer etc. than in *A. kanagurta* of this size (120 mm.); also the first mid-dorsal post-cephalic scale is a striated bony plate.

Weber and Beaufort's figure is of a fish that agrees with Bleeker's in the appearance of the head, but is more elongate in form, the depth about  $2\frac{2}{3}$  in the length.

4. *Hilsa ilisha*.

*Clupanodon ilisha*, Ham. Buch. Fish. Ganges, p. 243, pl. xix. fig. 75.

*Alosa palasah*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 432 (1847).

*Clupea palasah*, Günth. Cat. Fish. vii. p. 445 (1868).

*Clupea ilisha*, Day, Fish. India, p. 640, pl. clxxii. fig. 3 (1878).

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head  $3\frac{1}{4}$  to  $3\frac{3}{4}$ . Parietal ridges narrow, covered with smooth skin in the adult fish. Snout as long as or longer than diameter of eye, which is  $4\frac{2}{3}$  to 7 in the length of head; maxillary extending to below posterior part of eye or beyond; width of operculum from a little more than  $\frac{1}{2}$  to  $\frac{2}{3}$  of its depth; 120 (young) to 220 gill-rakers on lower part of anterior arch. 45 to 48 scales in a longitudinal and 17 to 20 in a transverse series; ventral scutes 17-19+13-14. Dorsal 18-20. Anal 18-21. Pelvic fins below anterior part of dorsal. Caudal fin about as long as the head. Vertebrae 47.

Persian Gulf to Burma.

Several specimens, 130 to 350 mm. in total length.

5. *Hilsa reevesii*.

*Alosa reevesii*, Richards, Ichth. China, p. 305 (1846).

*Alosa palasah*, Richards, *t. c.* p. 306.

*Clupea reevesii*, Günth. Cat. Fish. vii. p. 446 (1868).

Depth of body 3 to  $3\frac{1}{4}$  in the length, length of head 3 to  $3\frac{1}{2}$ . Upper surface of head covered with skin; no striated bones exposed, except in the young. Snout longer than diameter of eye, which is 5 to 9 in length of head; maxillary extending to below posterior part or edge of eye, or a little beyond; width of operculum  $\frac{2}{3}$  or more than  $\frac{2}{3}$  of its depth; gill-rakers long and slender. 150 (young) to 250 on lower part of anterior arch. 42 to 45 scales in a longitudinal, 16 or 17 in a transverse series; ventral scutes 18+13-14. Dorsal 17-18. Anal 18-19. Pelvics below anterior half of dorsal. Caudal fin about as long as the head.

China.

Seven examples, 150 to 500 mm. long, from Shanghai and Kiu Kiang.

6. *Hilsa toli*.

*Alosa toli*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 435 (1847); Bleek.

Atl. Ichth. vi. p. 113, Clup. pl. viii. fig. 4 (1872).

*Alosa ctenolepis*, Bleek. Verh. Bat. Gen. xxiv. 1852, Haringacht. p. 32.

*Clupea toli*, Günth. Cat. Fish. vii. p. 447 (1868); Day, Fish. India, p. 641, pl. clxxii. fig. 2 (1878); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 64 (1913).

*Clupea chapra*, Günth. *l. c.*

Depth of body  $2\frac{2}{3}$  to  $3\frac{1}{4}$  in the length, length of head  $3\frac{1}{2}$  to 4. Parietal ridges narrow, covered with smooth skin in the adult fish. Snout as long as or longer than diameter of eye, which is  $4\frac{1}{3}$  to  $7\frac{1}{2}$  in the length of head; maxillary extending to below posterior part of eye or beyond; width of operculum from  $\frac{1}{2}$  to nearly  $\frac{2}{3}$  of its depth; 70 to 95 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal and 14 or 15 in a transverse series; ventral scutes 17-18+11-13. Dorsal 17-19. Anal 18-21. Pelvics below middle of dorsal. Caudal lobes, in the adult fish, nearly  $1\frac{1}{2}$  as long as head.

India, Malay Peninsula and Archipelago.

Several examples, 120 to 450 mm. in total length.

#### 7. *Hilsa macrura*.

*Alosa macrurus*, Bleek. Verh. Bat. Gen. xxiv. 1852, Haringacht. p. 31;

Atl. Ichth. vi. p. 113, Clup. pl. vi. fig. 4 (1872).

*Clupea macrura*, Günth. Cat. Fish. vii. p. 448 (1868); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 65 (1913).

Depth of body  $2\frac{2}{3}$  to  $3\frac{1}{4}$  in the length, length of head 4 to  $4\frac{2}{3}$ . Parietal ridges narrow, covered with smooth skin in the adult fish. Snout not longer than diameter of eye, which is 4 to 5 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; width of operculum  $\frac{1}{2}$  its depth; 60 to 80 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal and 14 or 15 in a transverse series; ventral scutes 16-18+11-15. Dorsal 17-20. Anal 18-21. Pelvics below middle or anterior part of dorsal. Caudal lobes, in the adult fish, nearly twice as long as head.

Sunda Islands.

Three examples, 160 to 350 mm. in total length.

#### 8. GUDUSIA, Fowler, 1911.

Proc. Acad. Philadelphia, lxiii. p. 207.

Distinguished from *Hilsa* by the smaller scales.

Two species from the rivers of India and Burma.

##### 1. *Gudusia chapra*.

*Clupanodon chapra*, Ham. Buch. Fish. Ganges, p. 248.

*Clupea indica*, Gray, Ill. Ind. Zool.; Günth. Cat. Fish. vii. p. 444 (1868).

*Alausa microlepis*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 439 (1847).

*Clupea chapra*, Day, Fish. India, p. 639, pl. clxi. fig. 1 (1878).

*Clupea sukia*, Chaudhuri, Rec. Ind. Mus. vii. 1912, p. 439, pl. xxxviii fig. 1.

Depth of body  $2\frac{2}{3}$  to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{4}$  to  $3\frac{1}{2}$ . Snout shorter than diameter of eye, which is 4 in length

of head; maxillary extending to below anterior part or middle of eye; 200 or more gill-rakers on lower part of anterior arch. 75 to 100 scales in a longitudinal and 27 to 34 in a transverse series; ventral scutes 18-20+8-10. Dorsal 14-16. Anal 20-24. Pectoral 13-14. Pelvics nearly below origin of dorsal. Usually a dark humeral spot, sometimes followed by a series.

Northern India, from Sind to Assam.

Several examples, 120 to 140 mm. long.

## 2. *Gudusia variegata*.

*Clupea variegata*, Day, Proc. Zool. Soc. 1869, p. 263; Fish. India, p. 639, pl. clxi. fig. 4.

Depth of body  $2\frac{1}{2}$  in the length, length of head  $3\frac{3}{4}$ . Snout a little shorter than diameter of eye, which is  $4\frac{1}{4}$  in length of head; maxillary extending to below middle of eye; more than 200 gill-rakers on lower part of anterior arch. 90 scales in a longitudinal and 32 in a transverse series; ventral scutes 19+10. Dorsal 16. Anal 23. Pectoral 14. Pelvics nearly below origin of dorsal. Back with several vertically expanded dark spots.

Burma.

A single specimen, 166 mm. in total length.

According to Day, this species differs from *G. chapra* in the deeper body, the coloration, and 24 to 29 instead of 21 to 24 anal rays.

## 9. CLUPANODON, Lacep. 1803\*.

Hist. Nat. Poiss. v. p. 468; Bleek. Atl. Ichth. vi. p. 112 (1872).

*Konosirus*, Jord. & Snyder, Proc. U.S. Nat. Mus. xxiii. 1900, p. 349.

Mouth toothless, terminal or subterminal, with lateral

\* Of the six species placed by Lacepède in *Clupanodon*, Jordan (in collaboration) has at different times regarded as the genotype: 1. *jussieui* (by designation), 2. *pilchardus* (by elimination), and 3. *thrissa* (the first species). But before this, in 1872, Bleeker (Atl. Ichth. vi. p. 112) stated that *Clupanodon thrissa* was the type of Lacepède's genus. Reference to Lacepède's work leaves no doubt that his species was the true *Clupea thrissa* of Linnæus, who took the name and the diagnosis respectively from Osbeck and from Langerström. Lacepède took the specific name from Linnæus, and gave China as the first locality; his description of the pointed lower jaw and the notched upper jaw, and his statement that the fish spawns in fresh water, apply quite well to the Chinese species, but not to the Antillean species (*Opisthonema oglinum*), which so many of the older writers believed to be the same fish. Consequently I regard the *Clupea thrissa* of Osbeck, Linnæus, and Lacepède, and not the *Clupea thrissa* of Bloch and of Günther, as the type of *Clupanodon*.



cleft; maxillary normally formed, extending to below anterior part or middle of eye; anterior supramaxillary absent. Gill-rakers slender, very numerous. Dorsal 15-18; last ray produced into a filament. Anal 20-28. Pelvics 8-rayed, below anterior part of dorsal. 48 to 58 scales in a longitudinal series, 20-23 in a transverse series. Vertebrae 51 (in *C. punctatus*).

Coasts and rivers of China and Japan.

### 1. *Clupanodon thrissa*.

*Clupea thrissa*, Osbeck, Iter Chinensis, p. 257 (1757); Linn. Syst. Nat. ed. 10, p. 318 (1758).

*Clupanodon thrissa*, Lacep. Hist. Nat. Poiss. v. p. 468 (1803).

*Chatoessus maculatus*, Richards, Ichth. China, p. 308 (1846); Günth. Cat. Fish. vii. p. 409 (1868).

*Chatoessus osbecki*, Cuv. & Val. Hist. Nat. Poiss. xxi. p. 106 (1848).

Depth of body  $2\frac{2}{3}$  to 3 in the length, length of head  $3\frac{1}{2}$ . Diameter of eye  $4\frac{1}{2}$  to 5 in length of head. Mouth terminal; maxillary extending to below anterior part or middle of eye. 48 scales in a longitudinal, 20 in a transverse series; ventral scutes 18-20+10-12. Dorsal 15-16. Anal 22-27. Pelvics below anterior  $\frac{1}{3}$  of dorsal. A dark humeral spot, sometimes followed by a series of spots.

China; Formosa.

Three specimens of 150-200 mm. from Formosa; two from China, 60 and 90 mm., are not included except for counts of fin-rays etc.

### 2. *Clupanodon punctatus*.

*Chatoessus punctatus*, Schlegel, Faun. Japon., Poiss. p. 240, pl. cix. fig. 1 (1846); Cuv. & Val. Hist. Nat. Poiss. xxi. p. 107 (1848); Günth. Cat. Fish. vii. p. 408 (1868).

*Chatoessus aquosus*, Richards, Ichth. China, p. 307 (1846); Cuv. & Val. Hist. Nat. Poiss. xxi. p. 109 (1848).

*Konosirus punctatus*, Jord. & Herre, Proc. U.S. Nat. Mus. xxxi. 1906, p. 624.

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{2}{3}$  to  $4\frac{1}{3}$ . Diameter of eye  $4\frac{1}{2}$  to 5 in length of head. Mouth subterminal; maxillary extending to below anterior part or nearly to middle of eye. 53 to 58 scales in a longitudinal, 20 to 23 in a transverse series; ventral scutes 18-21+14-17. Dorsal 16-18. Anal 20-25. Pelvics below anterior  $\frac{1}{3}$  of dorsal. A dark humeral spot; a dark spot on each scale of upper half of body. Vertebrae 51.

China; Japan.

Eleven specimens, 150-200 mm. in total length.

10. *SIGNALOSA*, Everm. & Kendall, 1898.

Bull. U.S. Fish. Comm. 1897, p. 127.

Mouth toothless, terminal, with lateral cleft; maxillary normally formed, extending to below anterior edge of eye or a little beyond; two supramaxillaries. Gill-rakers slender, very numerous. Dorsal 13-16; last ray produced into a filament. Anal 21-27. Pelvics 8-rayed, below or a little in advance of origin of dorsal. About 40 scales in a longitudinal series. Vertebrae 41.

Rivers from Southern U.S.A. to Central America.

1. *Signalosa mexicana*.

*Chatoessus mexicanus*, Günth. Cat. Fish. vii. p. 409 (1868).

*Dorosoma mexicanum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 416.

*Signalosa atchafalaye*, Jord. & Everm. t. c. 1898, p. 2809, fig. 184.

*Signalosa mexicana*, Meek, Zool. Publ. Columbian Mus. v. 1904, p. 94.

Depth of body  $2\frac{3}{4}$  to 3 in the length, length of head 3 to  $3\frac{3}{5}$ . Diameter of eye  $3\frac{1}{2}$  to 4 in length of head; maxillary extending to below anterior edge or  $\frac{1}{4}$  of eye. 200 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal series; ventral scutes 16-18 + 8-10. Dorsal 13-15; origin equidistant from end of snout and base of caudal, or nearer former. Anal 23-27. Pelvics inserted a little in advance of origin of dorsal. A dark humeral spot.

Louisiana to Central America, in rivers emptying into the Gulf of Mexico.

Nine specimens, 70 to 100 mm. in total length.

2. *Signalosa petenensis*.

*Meletta petenensis*, Günth. Proc. Zool. Soc. 1866, p. 603.

*Chatoessus petenensis*, Günth. Cat. Fish. vii. p. 408 (1868).

Depth of body 3 in the length, length of head  $3\frac{1}{5}$  to  $3\frac{3}{5}$ . Diameter of eye  $3\frac{1}{2}$  to 4 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  or edge of eye. 160 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal series; ventral scutes 14-16 + 10-12. Dorsal 15-16; origin nearer to end of snout than to base of caudal. Anal 21-24. Pelvics inserted below origin of dorsal. A dark humeral spot.

Lake Peten.

Four specimens, 70 to 90 mm. in total length.

# 11. DOROSOMA, Rafin. 1820.

Ichth. Ohiensis, p. 39.

*Chatoessus* (part.), Cuv. Règne Anim. ed. 2, ii. p. 320 (1829); Günth. Cat. Fish. vii. p. 406 (1868).

*Chatoessus*, Cuv. & Val. Hist. Nat. Poiss. xxi. p. 94 (1848).

Mouth subterminal or inferior; maxillary narrowed distally; anterior supramaxillary absent. Gill-rakers slender, very numerous. Dorsal 12-15; last ray produced into a filament. Anal 26-38. Pelvics 8-rayed, in advance of dorsal. 55 to 80 scales in a longitudinal series. Vertebrae 50.

Atlantic coast and rivers of North and Central America.

## 1. *Dorosoma cepedianum*.

*Megalops cepedianus*, Le Sueur, Journ. Acad. Philadelphia, i. 1818, p. 361.

*Clupea heterura*, Rafinesque, Amer. Monthly Mag. 1818, p. 354.

*Dorosoma notata*, Rafinesque, Ichth. Ohiensis, p. 39 (1820).

*Chatoessus ellipticus*, Kirtland, Rep. Zool. Ohio, p. 169 (1839).

*Dorosoma insociabilis*, Abbott, Proc. Acad. Philadelphia, 1860, p. 365.

*Chatoessus cepedianus*, Günth. Cat. Fish. vii. p. 409 (1868).

*Dorosoma cepedianum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 416, and 1900, fig. 183.

*Dorosoma cepedianum exile*, Jord. & Everm. l. c.

*Dorosoma exile*, Meek, Zool. Publ. Columbian Mus. v. 1904, p. 94.

Mouth small, subterminal or inferior; maxillary extending to below anterior edge of eye. Depth of body 2 to 3 in the length, length of head  $3\frac{3}{4}$  to  $4\frac{1}{3}$ . Diameter of eye 4 to 5 in length of head. 55 to 65 scales in a longitudinal series, 21 to 29 in a transverse series; ventral scutes 17-19+10-13. Dorsal 13-15. Anal 30-34. Pelvics inserted in advance of origin of dorsal. A dark humeral spot, most prominent in the young.

Cape Cod to Mexico, entering rivers.

Here described from five specimens, 180 to 260 mm. long, from Virginia, Illinois, and Texas. In these the body is deeper (depth 2 to  $2\frac{1}{3}$  in the length) in the examples from Virginia than in those from Illinois and Texas (depth  $2\frac{2}{3}$  to 3 in the length); but in young specimens this difference is not apparent, the depth being about  $\frac{1}{3}$  of the length in both forms.

## 2. *Dorosoma anale*.

*Dorosoma anale*, Meek, Zool. Publ. Columbian Mus. v. 1904, p. 93, fig.

Depth of body  $2\frac{2}{3}$  to 3 in the length. About 70 scales in

a longitudinal series. Dorsal 13-14. Anal 35-38. In other respects like *D. cepedianum*.

Atlantic coast streams of Mexico south of Vera Cruz.

Two examples, 120 to 160 mm. long, from Perez (Meek).

### 3. *Dorosoma chavesi*.

*Dorosoma chavesi*, Meek, Zool. Publ. Columbian Mus. vii. 1907, p. 112.

Mouth rather large, with the jaws nearly equal anteriorly, the mandible nearly  $\frac{1}{2}$  the length of head and the slender maxillary extending to below the middle of the eye. Depth of body  $2\frac{4}{5}$  in the length, length of head  $2\frac{3}{4}$  to 3. Diameter of eye 3 to  $3\frac{1}{3}$  in length of head. 74 to 78 scales in a longitudinal series; ventral scutes 17-19+9-10. Dorsal 12-15. Anal 26-30. A dark humeral spot.

Total length 47 to 210 mm.

Lakes Managua and Nicaragua.

## 12. NEMATALOSA, gen. nov.

Mouth toothless, subterminal or inferior, transverse, its cleft forming an angle; maxillary slender, distally slightly expanded and curved downwards; edge of dentary reflected outwards in front of extremity of maxillary; one supra-maxillary. Gill-rakers slender, very numerous. Dorsal 13-18; last ray prolonged into a filament; a scaly sheath at base. Anal 18-24. Pelvics 8-rayed, below or a little in advance of dorsal. Scales 44-50 in a longitudinal series, 14-21 in a transverse series. Vertebrae 43 (in *N. erebi*).

Coasts and rivers of Asia and Australia from Arabia to Japan and New South Wales.

### *Synopsis of the Species.*

I. Second suborbital covering cheek, its anterior edge vertical and its lower edge horizontal and in contact with lower limb of præoperculum ..... 1. *nasus*.

II. Second suborbital with oblique antero-inferior edge; a naked area above lower limb of præoperculum.

A. Dorsal 16-18; pelvics below anterior part or middle of dorsal.

Anal 21-23; depth 3 in length ..... 2. *japonica*.

Anal 19; depth  $2\frac{3}{5}$  in length ..... 3. *arabica*.

Anal 20-22; depth 2 to  $2\frac{1}{2}$  in length ..... 4. *come*.

B. Dorsal rays 13-16. Anal 18-22.

Depth 2 to  $2\frac{1}{2}$  in length; eye  $3\frac{1}{3}$  (young) to 5 (very large fish) in length of head; pelvics below or immediately in advance of origin of dorsal ..... 5. *erebi*.

Depth  $2\frac{1}{3}$  to  $2\frac{4}{5}$  in length; eye 4 (young) to 5 (adult) in length of head; pelvics below anterior  $\frac{1}{2}$  of dorsal .. 6. *horni*.

1. *Nematalosa nasus*.

*Clupea nasus*, Bloch, *Ausl. Fische*, ix. p. 116, pl. cccxxix. fig. 1 (1795).

*Chatoessus altus*, Gray, *Ill. Ind. Zool.* pl. xci. fig. 2 (1835).

*Chatoessus nasus*, Cuv. & Val. *Hist. Nat. Poiss.* xxi. p. 104 (1848);

Day, *Fish. India*, p. 634, pl. clx. fig. 4 (1878).

*Chatoessus champole*, Günth. *Cat. Fish.* vii. p. 410 (1868).

Depth of body  $2\frac{2}{5}$  to  $2\frac{1}{5}$  in the length, length of head  $3\frac{2}{3}$  to 4. Snout as long as or shorter than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; second suborbital covering cheek, with vertical anterior edge and horizontal inferior edge attached to lower limb of præoperculum. 45 to 50 scales in a longitudinal series, 15 to 19 in a transverse series; ventral scutes 16-19+10-12. Dorsal 15-17. Anal 21-24. Pelvics below origin or anterior  $\frac{1}{3}$  of dorsal. Dark longitudinal streaks along upper series of scales; often a dark humeral spot.

India.

Several examples, 100 to 200 mm. long, from Sind, Bombay, Canara, Madras, Calicut, and Burma.

2. *Nematalosa japonica*, sp. n.

Depth of body 3 in the length, length of head  $4\frac{1}{3}$ . Snout as long as diameter of eye, which is  $4\frac{1}{2}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; second suborbital with oblique lower edge. 48 to 50 scales in a longitudinal series, 19 or 20 in a transverse series; ventral scutes 19-20+12-14. Dorsal 16-18. Anal 21-23. Pelvics below middle or anterior part of dorsal. A dark humeral spot.

Inland Sea of Japan.

Three specimens, 200 mm. in total length.

3. *Nematalosa arabica*, sp. n.

Depth of body  $2\frac{3}{5}$  in the length, length of head  $3\frac{2}{5}$ . Snout as long as diameter of eye, which is  $4\frac{1}{2}$  in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; second suborbital with oblique lower edge. 50 scales in a longitudinal series, 19 in a transverse series; ventral scutes 18+13. Dorsal 17. Anal 19. Pelvics a little in advance of middle of dorsal. Dark longitudinal streaks along series of scales on upper part of body.

Muscat.

A single specimen, 150 mm. in total length.

4. *Nematalosa come*.

*Chatoëssus come*, Richards, 'Erebus' and 'Terror' Fish. p. 62, pl. xxxviii. figs. 7-10 (1846).

*Chatoëssus nasus*, Günth. Cat. Fish. vii. p. 407 (1868).

*Dorosoma nasus*, Bleek. Atl. Ichth. vi. p. 142, Clup. pl. ii. fig. 4 (1872); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 24 (1913).

Depth of body 2 to  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to 4. Snout nearly as long as or shorter than diameter of eye, which is 3 to 4 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; lower edge of second suborbital oblique. 46 to 50 scales in a longitudinal series, 17 to 20 in a transverse series; ventral scutes 18-20+10-12. Dorsal 16-18. Anal 20-22. Pelvics below anterior part or middle of dorsal. Dark longitudinal streaks along upper series of scales; a blackish humeral spot.

Indo-Australian Archipelago.

Several examples up to 200 mm. in total length, including one that I believe to be the type of the species (*C. nasus*, specimen *k* of Günther).

5. *Nematalosa erebi*.

*Chatoëssus erebi*, Günth. Cat. Fish. vii. p. 407 (1868).

Depth of body 2 to  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to  $4\frac{1}{3}$ . Snout as long as or shorter than diameter of eye, which is  $3\frac{1}{3}$  to 5 in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; second suborbital with oblique lower edge. 46 to 50 scales in a longitudinal series, 17 to 21 in a transverse series; ventral scutes 18-19+10-12. Dorsal 13-16; origin above or immediately behind base of pelvics. Anal 18-22.

East coast of Australia.

Several examples, 100 to 350 mm. in total length, from Cape York, Burnett R., Mary R., and New South Wales.

6. *Nematalosa horni*.

*Chatoëssus horni*, Zietz, Rep. Horn. Exped. ii. p. 180, pl. xvi. fig. 6 (1896).

Depth of body  $2\frac{1}{3}$  to  $2\frac{4}{5}$  in the length, length of head  $3\frac{1}{3}$  to 4. Snout as long as or shorter than diameter of eye, which is 4 to 5 in the length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; lower edge of second suborbital oblique. 44 to 46 scales in a longitudinal series, 15 to 18 in a transverse series; ventral scutes 16-18+9-11. Dorsal 13-16. Anal 18-22. Pelvics below anterior  $\frac{1}{2}$  of dorsal.

Australia.

Five of the types, 100–170 mm. long, from Red Bank Creek, McDonnell Range; numerous examples from the Bulloo Creek, interior of Queensland ('Challenger') and some from the Borwan R., interior of New South Wales (*Stead*).

13. *GONIALOSA*, gen. nov.

Mouth formed as in *Nematalosa*. Dorsal 14–17; a scaly sheath at base; last ray not prolonged. Anal 22–28. Pelvics 8-rayed, below or in advance of origin of dorsal. Scales 45–75 in a longitudinal series, 16–25 in a transverse series. Vertebrae 44–46.

Rivers of India and Burma.

1. *Gonialosa modesta*.

*Chatoessus modestus*, Day, Proc. Zool. Soc. 1869, p. 622, and Fish. India, p. 633, pl. clx. fig. 1 (1878).

Depth of body 2 to  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{2}$  to  $4\frac{1}{4}$ . Snout shorter than diameter of eye, which is 3 to  $3\frac{1}{2}$  in the length of head; maxillary extending to below anterior edge of eye. 45 to 47 scales in a longitudinal series, 16 to 18 in a transverse series; ventral scutes 17–19+9–12. Dorsal 14–17. Anal 24–28. Pelvics below or in advance of origin of dorsal. Vertebrae 44. Usually a dark humeral spot.

Burma.

Seven specimens up to 100 mm. in total length.

2. *Gonialosa manmina*.

*Clupanodon manmina*, Ham. Buch. Fish. Ganges, p. 247 (1822).

? *Clupanodon cortius*, Ham. Buch. t. c., p. 249.

*Chatoessus manmina*, Cuv. & Val. Hist. Nat. Poiss. xxi. p. 114 (1848);

Day, Fish. India, p. 633, pl. clx. fig. 2 (1878).

*Chatoessus cortius*, Günth. Cat. Fish. vii. p. 410 (1868).

Depth of body  $2\frac{3}{5}$  to  $3\frac{1}{5}$  in the length, length of head  $3\frac{3}{4}$  to  $4\frac{1}{4}$ . Snout shorter than diameter of eye, which is 3 to  $3\frac{1}{2}$  in length of head; maxillary not or barely reaching eye. 55 to 65 scales in a longitudinal series, 21 to 25 in a transverse series. Ventral scutes 16–19+10–13. Dorsal 14–17. Anal 22–26. Pelvics below or in advance of dorsal. Vertebrae 46. Sometimes a dark humeral spot.

Northern India and Assam.

Several specimens, to 130 mm. in length.

## 14. ANODONTOSTOMA, Bleek. 1849.

Verh. Batav. Genootsch. xxii., Madura, p. 15.

Differs from *Gonialosa* in that the maxillary is a straight, thin, transversely expanded lamina, tapering distally, whilst the supramaxillary is very slender. Dorsal 17-19, with a well-developed scaly sheath extending to tip of last ray. Anal 18-21, depressible in a scaly sheath. Pelvics 8-rayed, below middle or anterior half of dorsal. Scales 40-42 in a longitudinal series, 12-17 in a transverse series. Vertebrae 42.

Coasts and rivers of India and Indo-Australian Archipelago.

1. *Anodontostoma chacunda*.

*Clupanodon chacunda*, Ham. Buch. Fish. Ganges, p. 246 (1822).

*Chatoessus chacunda*, Cuv. & Val. Hist. Nat. Poiss. xxi. p. 111 (1848); Günth. Cat. Fish. vii. p. 411 (1868); Day, Fish. India, p. 632, pl. clx. fig. 3 (1878).

*Anodontostoma hasseltii*, Bleek. Verh. Batav. Genootsch. xxii. 1849, Madura, p. 15.

*Chatoessus selangkai*, Bleek. Verh. Batav. Genootsch. xxiv. 1852, Haringacht, p. 47.

*Dorosoma chacunda*, Bleek. Atl. Ichth. vi. p. 143, Clup. pl. iii. figs. 5, 6 (1872); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 25, fig. 14 (1913).

Depth of body 2 to  $2\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$  to 4. Snout shorter than diameter of eye, which is 3 to  $3\frac{3}{4}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 40 to 42 scales in a longitudinal series, 12 to 15 in a transverse series; ventral scutes 16-18+10-11. Dorsal 17-19. Anal 18-21. Pelvics below middle or anterior part of dorsal. Dark longitudinal streaks along upper series of scales; a dark humeral spot.

India and Indo-Australian Archipelago.

Numerous examples, up to 160 mm. in total length.

2. *Anodontostoma breviceps*.

*Chatoessus breviceps*, Peters, Monatsb. Akad. Berlin, 1876, p. 848.

Depth of body  $2\frac{2}{3}$  in the length, length of head nearly 4. Snout  $\frac{1}{2}$  as long as eye; maxillary extending to below middle of eye. 42 scales in a longitudinal series, 17 in a transverse series. Dorsal 19. Anal 19. Pelvics below middle of dorsal. Longitudinal dark stripes along upper series of scales.

Total length 230 mm.

New Hanover.



XXVII.—*Notes on Fossorial Hymenoptera.*—XXVII. *On new Species in the British Museum.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family Scoliidæ.

Subfamily ELIDINÆ.

*Elis bodkini*, sp. n.

♀. Nigra; clypeo lateribus, orbitis internis externisque anguste, fascia transversa inter antennis, pronoto margine posteriore et margine anteriore late interrupto, mesonoto macula quadrata postice maculaque parva utrinque angulis posticis, postscutello fascia, segmento mediano fascia longitudinali utrinque, mesopleuris fascia verticali sub alis, segmento dorsali primo macula magna utrinque fasciæ angusta interrupta mediana, segmentis tertio, quarto quinq[ue] fasciæ basali, sexto macula transversa basali, segmentis ventralibus 2-4 fasciæ lata emarginata, quinto fasciæ mediana, angusta, interrupta, femoribusque intermediis anticisque macula apicali flavis; alis subhyalinis, area radiali late infuscata, venis fuscis; mandibulis ferrugineis.

Long. 13 mm.

♀. Clypeus finely punctured, subcarinate longitudinally in the middle; front and vertex coarsely punctured, with sparse pale fulvous hairs; frontal prominence subtuberculate on each side on the inner side of the scape. Thorax closely and rather coarsely punctured, more finely and closely on the pronotum than elsewhere; median segment subcarinate in the middle at the base, a triangular space at the base much more finely punctured than the rest of the dorsal surface, the sides of the segment shallowly obliquely striated. Abdomen shining, finely and closely punctured, more strongly and sparsely on the ventral surface; sixth dorsal segment closely and finely longitudinally striated. Second cubital cell very long, the second abscissa of the radius nearly half as long again as the third; first recurrent nervure received at three-fifths from the base of the second cubital cell, second at two-fifths from the base of the third cubital cell.

*Hab.* River Mazaruni, British Guiana (*G. E. Bodkin*); November 1916.

This is a smaller species than *flavopicta*, Sm., and has the vertex much more closely punctured; the puncturation of the thorax is much closer and finer, the markings are somewhat different, there is no blue gloss on the abdomen, and the

second abscissa of the radius is much longer. In the latter character it resembles the Central-American *E. pulchrina*, Cam., and *E. bicincta*, Sm., but differs from both in markings and in the finer and closer puncturation.

### Family Sapygidæ.

#### *Sapyga furtiva*, sp. n.

♀. Nigra; antennis ferrugineis, apice infuscatis; clypeo lateribus, fascia arcuata inter antennis, orbitis internis anguste, orbitis externis supra, pronoto margine antico late interrupto, mesopleuris macula sub alis, postscutello fascia transversa interrupta, segmento mediano macula magna apicali utrinque, segmentis abdominalibus 2-5 fascia lata transversa, sextoque dorsali macula magna ante apicem flavis; femoribus subtus, tibiis, tarsis, segmento dorsali primo fascia mediana, ventralique secundo basi ferrugineis; alis hyalinis, venis nigris, area radiali infumata.

Long. 11 mm.

♀. Mandibles very broad, tridentate at the apex; clypeus subrectangular, broader than long, the apical angles produced, longitudinally rugose. Head closely punctured-rugose; antennæ thickened towards the apex, much stouter at the base than in *clavicornis*; posterior ocelli at least half as far again from the eyes as from each other. Thorax very closely punctured; abdomen shining, minutely and closely punctured. Second abscissa of the radius half as long as the third, more than twice as long as the first.

*Hab.* Simla Hills, 6300 ft.

Nearly allied to *clavicornis*, but differs in colouring, in the larger second cubital cell, and in the stouter basal joints of the flagellum.

### Family Crabronidæ.

#### Subfamily LARRINÆ.

#### *Dimorpha ruficaudata*, sp. n.

♀. Nigra; flagello fusco; scapo, mandibulis, pedibusque ferrugineis; tegulis fuscis, apice testaceis; segmentis abdominalibus 4-6 rufis; alis hyalinis, venis fuscis.

Long. 8 mm.

♀. Head sparsely punctured, the clypeus and front clothed with long cinereous hairs, clypeus very short, transverse at the apex, finely punctured and subcarinate in the middle; second joint of the flagellum distinctly longer than the third;

posterior ocelli twice as far from each other as from the eyes. Mesonotum shining, with scattered punctures, the anterior third closely punctured and clothed with cinereous hairs, which extend on to the pronotum, and more sparsely on to the mesopleuræ. Scutellum smooth and shining. Median segment strongly longitudinally striated, the space between the striæ more finely transversely striated, forming reticulations. Abdomen shining, microscopically punctured. Radial cell very short, on the costal margin about twice as long as the third abscissa of the radius, and not more than half as long again as the apical margin of the cell; third abscissa of the radius half as long again as the second, but only one-third of the length of the second transverse cubital nervure.

*Hab.* Nyasaland, Zomba (*H. S. Stannus*).

The colouring of the abdomen is unusual in the genus. I use Jurine's name *Dimorpha* for the genus instead of *Astatus*, Latr., as to which there is some confusion.

### *Notogonia nigricans*, Walk.

*Notogonia nigricans*, Walk. List of Hymen. in Egypt. p. 21 (1871). ♀.  
*Notogonia sculpturata*, Kohl, Ann. Naturh. Hofmus. Wien, vii. p. 221 (1892). ♂.

There is a co-type of Walker's species in the British Museum.

*Hab.* Egypt; Port Soudan; Albania; Gibraltar; St. Vincent, Cape Verde Islands.

### *Notogonia palumbula*, Kohl.

*Notogonia palumbula*, Kohl, Ann. Naturh. Hofmus. Wien, ix. p. 304 (1894).

*Notogonia punctipleura*, Cam., Sjöstedt, Kilimandjaro-Meru Exp. ii. p. 285 (1910). ♂.

This is merely the tropical subspecies of *nigricans*; the pygidial area of the female is narrower.

*Hab.* Cameroons; Kilimandjaro; Lake Nyasa; N.E. Rhodesia.

### *Notogonia reticulata*, Cam.

*Leptolarra reticulata*, Cam. Ann. & Mag. Nat. Hist. (7) v. p. 31 (1900).

This is the Indian subspecies of *nigricans*, differing from the typical form in the rather finer punctures of the mesonotum.

*Hab.* Barrackpore, N.E. India; Matheran, W. India; Chapra, Bengal.

Very closely allied to these three forms of *nigricans* is the Australian *N. retiaria*, Turn., in which the punctures of the mesonotum are almost obsolete and the eyes nearer to each other on the vertex. I do not consider that small differences in the comparative length of the abscissæ of the radius are to be relied on in this genus; there seems to be a slight individual variation in this respect. *N. mahensis*, Cam., from the Seychelles, differs from *reticulata* in the longer and rather narrower radial cell.

*Notogonia irrorata*, Sm.

*Larrada irrorata*, Sm. Cat. Hym. B.M. iv. p. 284 (1856). ♀.

*Larra* (*Notogonia*) *fraudulenta*, Kohl, Ann. Naturh. Hofmus. Wien, ix. p. 303 (1894). ♀.

*Hab.* Senegal; Sierra Leone; Ashanti; Uganda.

*Notogonia cræsus*, Sm.

*Larrada cræsus*, Sm. Cat. Hym. B.M. iv. p. 284 (1856). ♀.

*Notogonia cræsus*, Kohl, Ann. Naturh. Hofmus. Wien, ix. p. 300 (1894). ♀ ♂.

*Motes lirioides*, Turn. Trans. Ent. Soc. London, p. 753 (1912). ♀.

Although the tarsal ungues are toothed in this species in the female, the very different form of the pygidial area shows that it is not closely related to *Motes*.

*Hab.* East Africa from Mashonaland to Witu; West Africa, Gambia and Gold Coast.

Doubtless this species ranges through the whole of tropical Africa.

*Notogonia deceptor*, Turn.

*Motes deceptor*, Turn. Ann. & Mag. Nat. Hist. (8) xvii. p. 253 (1916). ♀.

This is closely related to *N. cræsus*, and is not a *Motes*. It may possibly prove to be a colour-variety of *cræsus*, the structural differences being very slight.

*Tachysphex excelsus*, sp. n.

♀. Nigra; segmentis abdominalibus primo secundoque, tertioque dimidio basali rufis; alis subhyalinis, leviter infuscatis.

Long. 12 mm.

♀. Clypeus broadly triangularly deflexed towards the

apex, the triangular surface shining, with large scattered punctures, the apical margin transverse. Eyes separated on the vertex by a distance equal to twice the length of the second joint of the flagellum; the third joint of the flagellum about as long as the first and second combined. Head and thorax very finely and closely punctured; median segment opaque, very finely granulate, the sides not striated; the posterior slope transversely striolate towards the apex, with a deep depression at the base. Abdomen highly polished; pygidial area elongate, rather sparsely and finely punctured. The long spur of the hind tibiæ distinctly shorter than the basal joint of the hind tarsus; spines of the fore tarsus forming a comb, slender and fairly long. Radial cell longer and narrower than in *T. pectinipes*; the second abscissa of the radius scarcely shorter than the third.

*Hab.* Tibet, Gyangtse, 13,000 ft. (*H. J. Walton*); June.

The sculpture of the median segment resembles *T. latifrons*, Kohl, from which it differs in other details. The eyes are further apart on the vertex than in *T. pectinipes*, to which it is allied in the form of the pygidial area.

### *Tachysphex filicornis*, Kohl.

*Tachysphex filicornis*, Kohl, Deutsch. Ent. Zeitsch. xxvii. p. 169.

This Mediterranean species occurs at Harar (*G. Kristensen*). A subspecies occurs at Salisbury, Mashonaland (*G. A. K. Marshall*), in which the sculpture of the median segment is much coarser, there being very distinct divergent striæ at the base, whereas the striæ, as far as they are developed in *filicornis*, are parallel. For this I suggest the name *Tachysphex filicornis excerptus*, subsp. n.

I do not regard the sculpture of the median segment as a very reliable character in this genus, considering that it is liable to considerable variation in some species.

### *Tachysphex auropilosus*, sp. n.

♀. Nigra; callis humeralibus, tegulis, abdomine, pedibusque rufo-testaceis; segmentis ventralibus nigro intaminatis; clypeo, fronte, thorace, segmento mediano, segmentisque dorsalibus margine apicali præcipue aureo-sericeo-pubescentibus; alis pallide flavo-hyalinis, apice pallidissime infuscatiss, venis testaceis.

Long. 14 mm.

♀. Clypeus broadly rounded at the apex; eyes separated on the vertex by a distance not quite equal to the length of

the second joint of the flagellum. Thorax and median segment very closely and minutely punctured, rather thinly covered with very short, delicate, golden pubescence; the posterior slope of the median segment finely transversely striated, with a deep median sulcus. Pygidial area elongate-triangular, shining, sparsely and rather strongly punctured, very narrowly truncate at the apex. Comb of the fore tarsi long; tibiae with short golden pubescence. Radial cell rounded at the apex, not truncate, third abscissa of the radius longer than the second, which is equal to the space between the recurrent nervures on the cubitus. Tarsal ungues very long, as in the genus *Notogonia*.

*Hab.* British East Africa, Simba, 3350 ft. (*S. A. Neave*), April; Makindu, 3300 ft. (*S. A. Neave*), April.

This seems to belong to the group of *T. quadricolor*, Gerst., but is a smaller and less robust species, and the eyes are nearer together on the vertex; the colour of the wings is also different. The elongate ungues are very remarkable.

*Tachysphex depilosellus*, sp. n.

♀. Nigra; mandibulis basi, clypeo dimidio apicali, scapo, flagello articulo primo, articuloque secundo basi, callis humeralibus, abdomine, pedibusque rufo-ferrugineis; alis anticis fuscis, posticis pallide fusco-hyalinis; venis nigris.

Long. 12 mm.

♀. Clypeus very broadly rounded at the apex, somewhat deflexed from the middle, the apical half shining, with a few large scattered punctures; the base of the clypeus and the front clothed with very short, sericeous, silver pubescence. Thorax closely microscopically punctured, the mesonotum and scutellum bare; dorsal surface of the median segment opaque, very closely and microscopically punctured, the sides of the segment obliquely, the apex transversely striated. Abdomen slender; pygidial area elongate-triangular, sparsely punctured. No pubescent fasciae on the dorsal segments. Tarsal comb long, the basal joint of the fore tarsus with eight spines. Radial cell broadly rounded at the apex; second abscissa of the radius longer than the third, which is longer than the space between the recurrent nervures on the cubitus.

*Hab.* N. Rhodesia, Pakasa (*O. Silverlock*); January.

A very slender species, easily distinguished by the fuscous wings from any other Ethiopian species with the abdomen red.

*Tachysphex brinckeræ*, sp. n.

♀. Nigra; mandibulis basi, tibiis anticis basi et subtus, tarsis anticis, tarsisque intermediis posticisque apice fusco-ferrugineis; segmentis abdominalibus primo secundoque rufo-ferrugineis; tegulis testaceis; alis flavo-hyalinis, apice pallidis; venis testaceis. Long. 13 mm.

♀. Clypeus broadly truncate at the apex, finely and closely punctured on the basal half; the apical half deflexed, shining, with large scattered punctures. Vertex very closely microscopically punctured; the eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum; front and the base of the clypeus clothed with very short silvery pubescence, which is only visible in certain lights. Thorax minutely and closely punctured; median segment granulate, as long as the mesonotum, the sides and apex of the segment striated. Second and third dorsal segments with a little short silver pubescence at the apical angles; pygidial area elongate-triangular, sparsely punctured. Comb of fore tarsus long, basal joint of the fore tarsi with eight spines. Radial cell broadly rounded at the apex; second abscissa of the radius longer than the third, nearly twice as long as the space between the recurrent nervures on the cubitus.

*Hab.* Transvaal, Pretoria (*Miss J. Brincker*).

*Tachysphex punctata*, Sm.

*Larrada punctata*, Sm. Cat. Hym. B.M. iv. p. 282 (1856). ♂ (as ♀).

*Larra punctata*, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 247 (1884).

The type is a male, not a female, and is a true *Tachysphex*. The wings are of a darker fuscous than in any other small black Ethiopian species of the genus known to me. Eyes separated on the vertex by a distance equal to about twice the length of the second joint of the flagellum.

*Tachysphex subfuscatus*, sp. n.

♀. Nigra; segmentis abdominalibus duobus basalibus fusco-rufis; tarsis fusco-ferrugineis; alis subhyalinis, venis fuscis; clypeo, fronte, segmentisque dorsalibus tribus basalibus fascia apicali argenteo-pubescentibus; thorace rugose punctato; segmento mediano longitudinaliter striato-reticulato.

Long. 9 mm.

♀. Clypeus broadly truncate at the apex, the apical

margin armed with a number of ill-defined teeth. Head closely and rather finely punctured; antennæ short and stout; eyes separated on the vertex by a distance slightly exceeding the length of the two basal joints of the flagellum. Thorax coarsely punctured-rugose; scutellum punctured; median segment irregularly longitudinally striate, with finer transverse striæ, giving a reticulate appearance, which is more strongly developed on the more coarsely sculptured sides of the segment. Pygidial area smooth, rather broadly triangular. Legs slender; comb of the fore tarsi long; spur of the hind tibia much shorter than the basal joint of the hind tarsi. Radial cell broadly obliquely truncate at the apex; second and third abscissæ of the radius subequal.

*Hab.* Nyasaland, Mlanje, 2300 ft. (*S. A. Neave*); October.

*Tuchysphex strigatus*, sp. n.

♀. Nigra; tarsi articulis apicalibus brunneo-ferrugineis; fronte clypeoque argenteo-pubescentibus; mesonoto crasse punctato, cinereo-piloso; segmentis dorsalibus tribus basalibus fascia interrupta apicali argenteo-pubescente; segmento mediano fortiter longitudinaliter striato; alis hyalinis, venis brunneo-ferrugineis; tegulis testaceis.

Long. 9-11 mm.

♀. Clypeus broadly subtruncate at the apex, the apical margin somewhat reflexed and with two blunt teeth on each side, closely and not very finely punctured. Front opaque, finely punctured-rugulose, the vertex closely and not very finely punctured. Eyes separated on the vertex by a distance half as great again as the length of the second joint of the flagellum. Mesonotum and mesopleuræ coarsely punctured-rugose; scutellum strongly but not very closely punctured. Median segment coarsely longitudinally striated, with finer, irregular, transverse striæ between; the sides of the segment coarsely rugose-reticulate. Abdomen shining; pygidial area triangular, shining, with a few small scattered punctures. Radial cell rather broadly obliquely truncate at the apex; second abscissa of the radius a little longer than the third, equal to the distance between the recurrent nervures on the cubitus.

*Hab.* N.E. Rhodesia, between Fort Jameson and Lundazi, 4000 ft. (*S. A. Neave*), June; Central Angoniland, Lilongwe District, 4000-5000 ft. (*S. A. Neave*), May; Nyasaland, Mombera District, 4000 ft. (*S. A. Neave*), June; Nyasaland, Kotakota (*Dr. J. E. S. Old*).

Easily distinguished by the coarse sculpture of the thorax and median segment.



*Tachysphex vulneratus*, sp. n.

♀. Nigra; mandibulis basi, tegulis, tibiis tarsisque anticis, femoribus apice, tibiis intermediis et posticis subtus, tarsisque intermediis et posticis basi nigro intaminatis, brunneo-testaceis; segmentis abdominalibus quinto sextoque omnino, quartoque apice rufis; alis hyalinis, venis fuscis; fronte, clypeo, segmentisque dorsalibus tribus basalibus fascia apicali interrupta argenteo-pubescentibus; segmento mediano longitudinaliter striato.

♂. Feminæ similis, tibiis tarsisque intermediis et posticis brunneo-testaceis; segmentis dorsalibus sexto septimoque omnino, quintoque apice rufis; fronte clypeoque aureo-pubescentibus.

Long., ♀ 10-11, ♂ 8-9 mm.

♀. Clypeus truncate at the apex, rather broadly depressed on the apical margin, with two minute teeth on each side. Head finely and closely punctured; eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum; antennæ slender and rather long. Thorax closely and not very finely punctured; median segment strongly longitudinally striated, the sides of the segment more finely obliquely striated, the surface of the posterior truncation finely transversely striated. Pygidial area triangular, not elongate, shining, with a few scattered punctures. Comb of the fore tarsus long and slender; the long spur of the hind tibia almost as long as the basal joint of the hind tarsus. Radial cell long, rather narrowly rounded at the apex; third cubital cell about as long as the second, both on the cubitus and on the radius.

♂. Seventh dorsal segment broadly rounded at the apex; eighth ventral segment shallowly emarginate, the angles produced into distinct teeth.

*Hab.* N.E. Rhodesia, Niamadzi River, near Nawalia, 2000 ft. (*S. A. Neave*), August; Mid Luangwa Valley, 2000 ft. (*S. A. Neave*), July; Upper Luangwa Valley (*S. A. Neave*), August.

This differs from *strigatus* in colour, in the much finer sculpture of the thorax, in the lesser distance between the eyes, and in the long and slender antennæ.

*Prosopigastra neavei*, sp. n.

♀. Nigra; mandibulis in medio, abdomine segmentis tribus basalibus, calcaribus, tarsisque articulis apicalibus ferrugineis; tegulis testaceis; alis hyalinis, iridescentibus, venis nigris.

♂. Feminæ similis; segmentis abdominalibus 5 apicalibus nigris; tarsis ferrugineis; tibiis basi albido-maculatis.

Long., ♀ 7-8, ♂ 6 mm.

♀. Clypeus very widely arcuately deflexed towards the apex, the deflexed portion smooth and shining, the apical margin subtruncate. Eyes separated on the vertex by a distance equal to about four times the length of the second joint of the flagellum; head very distinctly but not very closely punctured; a smooth convex area between the anterior ocellus and the base of the antennæ. Thorax rather more strongly punctured than the head, the individual punctures large and clearly separated. Median segment scarcely more than half as long as the mesonotum; the dorsal surface margined by carinæ at the sides and apex, irregularly and coarsely striate-reticulate; the sides of the segment longitudinally striated, the posterior slope rugose. Abdomen closely and finely punctured; pygidial area shining, sparsely punctured, very narrowly truncate at the apex. Comb of the fore tarsi long and slender. Radial cell short, very broadly obliquely truncate at the apex; second and third abscissæ of the radius subequal, each at least half as long again as the fourth.

♂. Seventh dorsal segment broadly rounded at the apex; eighth ventral segment emarginate, testaceous, the apical angles produced into short spines. Eyes separated on the vertex by a distance not exceeding half the length of the second joint of the flagellum.

*Hab.* N.E. Rhodesia, Mid Luangwa Valley, about 2000 ft. (*S. A. Neave*), July and August; Nyasaland, between Ft. Jameson and Dowa, 4000 ft. (*S. A. Neave*), October.

The sexual divergence in the distance between the eyes on the vertex is greater than in any Mediterranean species of the genus.

#### Subfamily *TRYPOXYLONINÆ*.

##### *Pison papuanum*, Schulz.

*Pison papuanum*, Schulz, Berlin. Ent. Zeit. xlix. p. 217 (1904).

*Pison morosus*, Sm. Journ. Linn. Soc., Zool. viii. p. 85 (1864). ♀ (nec Sm. 1856).

*Pison constrictum*, Turn. Ann. & Mag. Nat. Hist. (8) ix. p. 201 (1912). ♂.

*Pison constrictum*, Turn. Proc. Zool. Soc. London, p. 627 (1916).

I had overlooked the name *papuanum* in my recent paper on *Pison*.

XXVIII.—*A new Tuberculate Terrestrial Isopod from New Zealand.* By CHAS. CHILTON, M.A., D.Sc., M.B., C.M., LL.D., C.M.Z.S., Professor of Biology, Canterbury College, New Zealand.

[Plate XIII.]

IN 1915\* I described a tuberculate species of *Cubaris* from New Zealand under the name *C. suteri*. Of this species I had only the one specimen, and I stated that of a second tuberculate species, *C. hamiltoni*, only a single specimen was known, these facts showing that our knowledge of the terrestrial Isopoda of New Zealand was still very incomplete. I suggested also that a careful survey, especially in the forests of the North Island, might bring to light other interesting species. This has already proved to be the case, and I have recently received from Mr. David Miller, of the New Zealand Agricultural Department, several specimens of another tuberculate *Cubaris* found under the bark of fallen logs in the bush at Levin, Wellington. Of this species Mr. Miller was fortunate enough to find eight specimens. In general appearance, colour, markings, etc., they are very similar to *Cubaris suteri*, and I at first thought that they might perhaps be specimens of this species with the tubercles on the dorsal surface better developed than in the type-specimen. This, however, proves not to be the case, as the tubercles, or, rather, ridges, are arranged differently, and I am therefore describing the specimens as a new species, which I have much pleasure in naming after their discoverer.

*Cubaris milleri*, sp. n. (Pl. XIII. figs. 1-6.)

*Specific description.*—Oblong-oval, breadth about half the length. Epimeral portions fairly well developed, especially in the first segment of the peræon; central portion of each segment very convex and marked off from the lateral portions by a longitudinal ridge or flange on each segment (figs. 1 & 2). Head with the anterior margin produced upwards into a well-defined ridge projecting slightly above the dorsal surface and having the upper margin regularly convex and without any notch; the posterior surface of the head is produced dorsally into a distinct transverse flange rising high above the general surface and showing in front view much higher than the

\* Journ. Linn. Soc. vol. xxxii. p. 425, pl. xxxvii. figs. 24-28.

anterior margin; the flange has a slight depression in the centre, so that its upper margin is concave (fig. 3). Each segment of the peræon bears a pair of longitudinal tubercles or ridges, which are low anteriorly but become higher towards the posterior part of the segment; these ridges increase in size and distinctness on the posterior segments until, in the seventh segment, the ridge is much higher than the segment itself and projects backwards over the pleon. In dorsal view these ridges form an almost continuous row, separating the central part of the body from the lateral portions. In each segment there are a few small tubercles or irregularities both on the lateral portions below the ridge and also on the central part between the ridges. Inferior margin of first segment of peræon deeply cleft posteriorly, the cleft extending nearly halfway along the whole margin; inferior margin of the second segment with a distinct tubercle on its inner surface enclosing a wide notch for the reception of the succeeding segment when the animal is rolled up into a ball (fig. 4). The pleon bears no ridges and shows the usual characters; the posterior segment has the hind margin either straight or very slightly concave (fig. 5).

Antennæ (fig. 3) of normal shape, the second and third segments of peduncle subequal, the fourth a little longer and the fifth nearly twice as long as the fourth; flagellum a little shorter than the fifth joint of peduncle, its first joint about one-third the length of the terminal joint.

The mouth-parts show the usual structure common to the genus, and do not appear to present any distinctive characters.

The legs are all short and of the usual form. In the single male dissected the anterior pairs do not show any special modification; but as the specimen is small and the legs imperfect the evidence on this point is not quite conclusive.

The pleopoda of the male do not appear to differ in any important points from those of other species of the genus.

The uropoda (figs. 5 & 6) have the endopod very short, almost knob-shaped, extending only a short distance from the base; its extremity bears two or three minute setæ. The exopod is also very small, reaching only about halfway from its attachment to the posterior end of the peduncle; it bears a rather long seta, which reaches nearly as far posteriorly as the peduncle.

Under a high power the whole integument shows minute scale-like markings.

*Colour.* Pale reddish brown, with marblings of a darker brown.

*Length* of largest specimen about 7 mm.

*Loc.* Under the bark of fallen logs in the bush, Levin, Wellington, N.Z.

This species appears to be closely related to *Cubaris suteri*, Chilton, the structure of the lateral margin of the first and second segments of the peræon and of the uropoda being closely similar in the two species. In *C. suteri*, however, the ridges are transverse and mainly confined to the posterior border of the peræon segments, while in the present species the ridges are longitudinal, extending along nearly the whole of the length of each segment, and they are much better developed and consequently more prominent. Another tuberculate species, *C. hamiltoni* (Chilton)\*, probably also comes near to these two species; but the dorsal surface is much more profusely supplied with flanges or ridges and with pointed tubercles. *C. hamiltoni* is known only from the single type-specimen which was obtained in the neighbourhood of Petane, near Napier, in New Zealand, and this specimen is unfortunately somewhat imperfect, so that our knowledge of the species is far from complete. The only other tuberculate species known from New Zealand is *C. macmahoni* (Chilton), originally described from Kenepuru in Marlborough, though I have since had specimens sent to me from one or two localities in the North Island. *C. spinosus* (Dana) is a spiny species, "the body bristled throughout with subacute spines"; but it is only known from Dana's brief description and figures, no specimen having been since collected. It was found by Dana near the Bay of Islands.

I am much indebted to my assistant, Miss E. M. Herriott, M.A., for preparing the drawings to illustrate this paper.

#### EXPLANATION OF PLATE XIII.

(All the figures refer to *Cubaris milleri*, sp. n.)

*Fig. 1.* Dorsal view of whole animal.

*Fig. 2.* Side view of animal (antennæ and legs not shown).

*Fig. 3.* Front view of head with antennæ etc., the flange arising from the posterior border of the head showing behind the anterior margin.

*Fig. 4.* Lateral margins of peræon segments 1, 2, and 3, from below.

*Fig. 5.* Terminal portion of pleon, from above.

*Fig. 6.* Uropoda and terminal segment, from below.

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\* See Trans. Linn. Soc., Zool. vol. viii. pp. 99-152, pls. xi.-xvi., and Trans. N.Z. Inst. vol. xlii. pp. 286-291.

XXIX.—*South-African Talitridæ.*

By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S.

ON Christmas Eve in 1916 Mr. H. W. Bell-Marley, of Durban, Natal, obtained some specimens of Talitridæ at Eshowe Bush, 1800 feet above sea-level. Of those which he has kindly forwarded to me most are females, but one or two males among them, though less in size than many of the other sex, will, I think, settle a question which has long been obscure. The species is clearly that which Spence Bate in 1862 named *Talorchestia ? africana*. Clearly, also, it may now be referred to the genus named *Talitriator* by Methuen in 1913, and more fully defined by Barnard in 1916.

## Genus TALITRIATOR, Methuen.

1913. *Talitriator*, Matthews, P. Z. S. Lond. p. 109.

1916. *Talitriator*, Barnard, Ann. S. African Mus. vol. xv. pt. 3, p. 222.

Related to *Talitrus* by feeble minutely chelate second gnathopods in both sexes; distinguished from it by the first antennæ nearly as long as the peduncle of the second; maxillipeds with small fourth joint to the palp; first gnathopod shorter than second; fifth side-plates of peræon more unequally bilobed; telson longer than broad.

Of these characters, the last two seem to be scarcely of generic importance. Spence Bate considers the fifth side-plate to be equally bilobed in *Talitrus*; but neither his own figures nor the facts support this statement.

*Talitriator africanus* (Bate).

1862. *Talorchestia ? africana*, Bate, Amphipodous Crust. Brit. Mus. p. 15, pl. ii. figs. 6, 6*i*, 6*h*.

1906. *Talorchestia ? africana*, Stebbing, 'Das Tierreich,' Lief. 21, p. 554.

1910. *Talorchestia ? africana*, Stebbing, Ann. S. Afr. Mus. vol. vi. pt. 4, p. 459.

1912. *Talitrus ? africanus* (Bate), Calman, Ann. & Mag. Nat. Hist. ser. 8, vol. x. p. 135 (1912).

1913. *Talitriator eastwoodæ*, Methuen, P. Z. S. Lond. p. 110, pls. x., xi.

1916. *Talitriator eastwoodæ*, Barnard, Ann. S. Afr. Mus. vol. xv. pt. 3, p. 223 (and *Talorchestia ? africana*, p. 215).

In the male specimen the flagellum of the first antennæ has ten joints, in the female eleven, in both sexes the third joint of the peduncle is the longest, in the second antennæ the flagellum of the male has 22, the larger female 23 joints. The palp of the first maxilla is minute. Of the customary

three teeth on the inner plate of the maxillipeds two are very conspicuous, but the innermost small, as shown by Methuen.

For the second gnathopod Methuen gives "coxal plate excavate behind with conical projection." Barnard mentions this as having specific value in the genus and as excluding the typical species from *Talitrus*. It is, however, found in *T. alluandi*, Chevreux, 1896. Methuen states that the first peraeopod is not quite as long as the second. This, surely, is an accidental reversing of the true relation. For the great size of the anterior lobe of the fifth side-plate there is a parallel in *T. alluandi*. Our specimens show four pairs of setules on the telson, while Methuen's figure shows only two pairs; but Barnard supposes that Methuen's specimens were probably not quite mature. A fine red colour was retained by Mr. Bell-Marley's specimens as received nearly two months after capture. As this is probably a terrestrial species, it is desirable to point out that in Methuen's notes on distribution the word "depths" has by some mischance been substituted for "heights" in the quotation from 'Das Tierreich.'

XXX.—*New Species of Indo-Malayan Lepidoptera.*  
By Colonel C. SWINHOE, M.A., F.L.S.

DANAINÆ.

*Salatura plexippus adnana*, nov.

♂ ♀. A local race of *plexippus*, uniformly smaller; all the black vein-markings narrower; the black apical portion of the fore wing broader, consequently the bronzy-red interspace between veins 2 and 3 much shorter; no indication of the small similarly coloured space always present in *plexippus* in the next upper interspace, just outside the cell-end, and the series of subapical bars all much shorter.

Expanse of wings, ♂  $2\frac{8}{10}$ , ♀ .3 inches.

Hab. Luzon.

Staudinger refers to this local race in 'Iris,' 1889, p. 28.

EUPLEINÆ.

*Isamia eclecta*, nov.

♂. Upperside dark blackish brown: fore wing paler on the outer third, the inner two-thirds with a slight blue-black

gloss; a minute blue-grey spot at the lower end of the cell, another outside it in the interspace above vein 4, and another above the upper end of the cell close to the costal margin: hind wing with the costal space whitish, descending a little into the cell; a very faint series of blue-grey dots close to the outer margin; no other markings on either wing. Under-side fairly uniform blackish brown, paler than it is above; fore wing with the hinder marginal space whitish; spots larger and more prominent, one at the lower end of the cell, another beyond it; a rather long oval spot in the interspace above vein 2, a small spot outside it, and three small spots close to the margin above the hinder angle, and two small spots at the base of the wing: hind wing with three basal small spots, one at the end of the cell, five in a line in the interspaces 2, 3, 4, 5, and 6, a submarginal spot in interspace 2, two close together in interspace 3, and one in interspace 4; a series of somewhat larger spots close to the margin in the interspaces up to interspace 4; cilia with white dots in the interspaces both above and below. Head with three white spots on each side; thorax above with a white central line; below, palpi with a white spot between them and one on each side, thorax covered with white spots, and the abdomen with a central row of larger spots.

Expanse of wings, ♂, 4 inches.

*Hab.* Palone, Burma, June 1887.

#### *PIERINÆ.*

##### *Hebomoia solomonensis*, nov.

♂. Fore wings with the orange apical portion occupying more than one-third of the wing, extending well into the cell, filling up very nearly the whole of interspace 3 and the outer and upper half of cell 2; the costal band very narrow, blackish grey powdered with ochreous, thickens a little at the apex, runs down the outer margin very narrowly, and ends in a blackish suffused small patch just above the hinder angle; the interior blackish band which usually limits the orange portion entirely absent; the submarginal blackish spots in the orange patch spear-shaped and very pale: hind wings without any marginal band. Head and body powdered with ochreous.

Expanse of wings, ♂,  $3\frac{2}{10}$  inches.

*Hab.* Solomons.

##### *Madais vi.*

*Teracolus vi*, Swinhoe, P. Z. S. 1884, p. 437, pl. xxxix. figs. 6, 7.

*Teracolus immaculata*, Rober, Seitz. Macro. Lep. i. p. 56.



My type came from the vicinity of Aden in Arabia, Rober's type from Syria ; I have both in my museum, and there can be no doubt they are identical. *Teracolus vi* is not mentioned in Seitz.

### Family Aganaidæ.

#### *Asota lara*.

*Hypsa lara*, Swinhoe, Ann. & Mag. Nat. Hist. (6) xii. p. 215 (1893).  
*Aganais intacta*, var., Snellen, Tijds. voor Ent. xxxi. p. 138, pl. ii. fig. 4 (1888).

#### *Hab.* Java.

It is a good species, quite different to *intacta*, Walker, having a broad, central, longitudinal stripe on the fore wing ; it is apparently quite common in Java ; I have received several examples from Mt. Gedé and Buitenzorg.

### Family Drepanidæ.

#### *Sewa orbiferata*.

*Abraxas orbiferata*, Walker, xxiv. 1126 (1862).  
*Argyris insignata*, Moore, P. Z. S. 1867, p. 645.  
*Platypteryx cilicoides*, Snellen, l. c. xxxii. p. 9, pl. i. fig. 3 (1889).

#### *Hab.* Sarawak, Borneo (type in B. M.).

The type of *insignata* in the B. M. is marked "Bengal." Snellen's type is from Java. I have it from Mone, Shan States (*Manders*), and from Kina Balu, Borneo (*Everett*). They are all very similar.

#### *Ticilia argentilinea*.

*Ticilia argentilinea*, Walker, xxxii. 394 (1865) ; Swinhoe, Cat. Het. Mus. Oxon. i. p. 244, pl. vii. fig. 13, ♂ (1892).  
*Platypteryx argentilinea*, Snellen, l. c. p. 8, pl. i. fig. 2, ♀ (1889).

#### *Hab.* Singapore (type ♀ in Mus. Oxon).

It is also from Sula in Mus. Oxon. (a ♂). Snellen also described his type from Java as *argentilinea*.

### Family Lasiocampidæ.

#### *Sitina cingra*, nov.

♀. Palpi black, with some white hairs on its upperside ; head and thorax covered with long ochreous-white (nearly pure white) hairs ; abdomen black ; anal tuft white : fore wing black, irrorated with very minute white atoms ; a large round black spot with a white line through it at the end of

the cell; an antemedial, sinuous, transverse white line; a postmedial diffuse white band, narrowing hindwards, and through it a black dentate line, curved outwards below the costa, its points outwards; a series of black lunules with white outer edges close to the margin; cilia with some white spots: hind wing paler, uniform in colour, without irrorations, a white waved band across its middle from the middle of the costa to the abdominal margin near the anal angle; cilia white, with pale blackish spots. Underside uniformly coloured like the upperside of the hind wing; a rather broad white band across both wings, evenly outwardly curved, postmedial on fore wing, medial on hind wing; the marginal marks on both wings as on the upperside. Body and legs black, with white hairs; abdomen with white lateral bands.

Expanse of wings  $1\frac{1}{2}$  inch.

*Hab.* N. Gippsland, Victoria (*H. W. Davey*).

It is unnamed in the B. M.

*Sitina epipasta*, nov.

♀. Palpi ochreous brown; head and shoulders covered with white hairs; thorax black, with ochreous-grey hairs; abdomen black, with some ochreous-grey hairs on the first two segments, small tufts of white hairs on the middle of the last two segments and on each segment at the sides; anal tuft white: fore wing grey, darkest on the middle of the costa, blackish on the basal half of the hinder margin, the wing covered with minute white irrorations, dense at the base and on the lower half of the middle; below the cell a white, sinuous, transverse, antemedial line; a small white lunular mark at the end of the cell; a postmedial band of grey lunules outwardly edged with white; a submarginal row of black lunules, outwardly edged with white; veins brown, finely marked with white: hind wing uniformly grey, with a nearly straight white band from the middle of the costa to the abdominal margin above the anal angle; cilia of both wings grey. Underside coloured uniformly grey as on the upperside of the hind wing; a transverse medial white band on both wings, nearly straight on fore wing, outwardly and evenly curved on hind wing. Body concolorous with the wings; abdomen with the lateral white spots continued into segmental bands, its anal segment white; legs with white hairs.

Expanse of wings  $1\frac{6}{10}$  inch.

*Hab.* Yackandandah, Victoria (*H. W. Davey*).

## Family Deilemerezidae.

*Deilemerez luzonica*, nov.

♀. Belongs to the *evergista* group, nearest to *aeres*, Boisd., and *gerra*, Swinhoe (Trans. Ent. Soc. 1903, p. 63, pl. iv. fig. 1); fore wing of the same blackish-brown colour; a longitudinal white streak near the base, shorter than in *gerra*, with a small white spot below it near the base; a very large white patch with waved outer side, commencing at the upper end of the cell in a narrow rounded form, broadening hindwards to the internal vein; its inner side is slightly excavated at the lower margin of the cell, and then runs inwards below the outer end of the basal streak, occupying a large portion of the central space of the wing; two large white, rounded, submarginal spots as in *gerra*, but much larger: hind wing with a narrow costal blackish-brown band and an even outer marginal band, as in *gerra*, with a submarginal white spot in it, a little below the apex. Head and body yellow; collar with two black spots; thorax covered with short green scales; abdomen with broad black segmental bands.

Expanse of wings  $1\frac{8}{10}$  inch.

Hab. Luzon, Philippines.

*Deilemerez purata*, nov.

♀. Milk-white; palpi white, the last joint black; top of head with a black spot, two on the collar; thorax with a black medial line, and another thinner line on each side of it; abdomen with a dorsal row of pale blackish spots; legs white, without markings: fore wings with the veins grey, a darker grey blotch or patch at the lower end of the cell: hind wing with dark grey streaks at the vein-ends, decreasing in size hindwards. Underside with all the vein-ends grey and a large space on the fore wing blackish from the base to the end of the cell, extending upwards to the costa, the veins through this black space white.

Expanse of wings  $1\frac{9}{10}$  inch.

Hab. Luzon, Philippines.

Figured by Semper as a female aberration\* of *Deilemerez sonticum*, Swinhoe, also from the Philippines; but I have in my museum both sexes of *sonticum* from Mindanao and Luzon. The sexes of that species are alike and are widely different from this form, though the palpi, head, and body are similarly marked.

\* Phil. Schmett. pl. lviii. fig. 7 (1899).

## Family Lymantriidæ.

*Euproctis servilis.*

*Euproctis servilis*, Walker, xxxii. 350 (1865). ♂.

*Darala prima*, Walker, xxxv. 1917 (1866). ♂.

*Euproctis incompta*, Snellen, Tijd. voor Ent. xx. p. 9, pl. i. fig. 2 (1879). ♂.

*Euproctis flavipennis*, Snellen, l. c. xxii. p. 107, pl. ix. fig. 1 (1879). ♀.

*Euproctis cinerea*, Heylearts, Ann. Soc. Ent. Belg. xxxvi. p. 10 (1892).

*Euproctis nurma*, Druce, Ann. & Mag. Nat. Hist. (7) iii. p. 469 (1899).

Type ♂, Celebes, in Mus. Oxon.

Type ♂ *prima*, Celebes, in Mus. Oxon.

Types ♂ *incompta*, Java, in coll. Snellen.

Type ♀ *flavipennis*, Makassar, Celebes, in coll. Snellen.

Type *cinerea*, Java.

Type *nurma*, Timor, in coll. Joicey.

As stated in my monograph of this family in Trans. Ent. Soc. 1903, p. 420, the colour of the fore wings varies much, from pale yellow to olive-brown, and the hind wings from yellow to white. I have the two extremes from the same locality; I have received it from Celebes, Java, Talaut, and Kina Balu, Borneo: the markings are all identical.

## Family Hadenidæ.

*Cirphis philippensis*, nov.

♂ ♀. Palpi, head, body, and fore wings brownish ochreous, much as in the common *C. loreyi*, Dup.: fore wing with a narrow white streak along the median vein to the end of the cell, with some blackish scales below its basal half; narrower white streaks on all the other veins, and still narrower (very fine) streaks in all the interspaces; some blackish scaling on the basal half of the hinder margin; a small black mark at the lower end of the cell, at the end of the white streak first mentioned, a black dot in the interspace below the middle of the cell, and another in the same interspace more than half the distance between it and the outer margin, some black points on the outer margin; cilia brownish ochreous, variegated by the white streaks running into it: hind wings pure white, without any markings. Underside with the fore wing paler, with the white streaks less distinct and a black spot one-sixth before the apex, close to the costa.

Expanse of wings, ♂ ♀, 1 $\frac{2}{10}$  inch.

*Hab.* Luzon, Philippines.

## Family Catocalidæ.

*Attatha flavata*, nov.

♀. Head and body yellow; collar black; a broad black band across the middle of the thorax; a square black patch at the base of the abdomen: fore wings bright yellow; a short black streak from the base; a long black streak on the hinder margin, not reaching the base nor the hinder angle; a black band from the middle of the costa, narrowing hindwards to near the hinder angle, and a triangular black patch from the costa near the apex, much as in *A. regalis*, Moore, from India; four black spots on the lower portion of the outer margin: hind wing paler yellow, with a marginal series of small black spots. Underside dull yellow, quite uniform in colour; a rather large, quadrate, blackish patch at the end of the cell; small black marginal spots on the hind wing.

Expanse of wings, ♀,  $1\frac{6}{10}$  inch.

*Hab.* Manilla; two examples received from Herr Semper as *A. flavata*, Semper ined., but has never been published.

*Attatha coccinea*, nov.

♀. A larger insect than *flavata*; head and thorax yellow; frons black; collar, middle band across thorax, and patch at base of abdomen black as in *flavata*; abdomen scarlet: fore wing bright yellow, the bands and streaks as in *flavata*; the apical patch not excavated on its outer side as in *regalis*, the central band narrower: hind wing scarlet, marginal spots small and black. Underside: both wings and body and legs uniform scarlet; fore wing with a dark black patch at end of cell as in *flavata*, but blacker, no black patch in the middle of the outer margin as in *regalis*, one black spot at the end of vein 3, and a series of black spots on the outer margin of the hind wing; the subterminal large black spot in *regalis* near the anal angle on the upperside not present.

Expanse of wings, ♀,  $1\frac{7}{10}$  inch.

*Hab.* Luzon (*Semper*).

## Family Stictopteridæ.

*Stictoptera poliata*, nov.

♀. Head, body, and fore wings dark grey, covered with blackish irrorations, which are uniformly distributed throughout the fore wings except in the middle of the wing, through which there is a prominent black thick line, uniform, and evenly outwardly curved, marginal points black: hind wings with

broad and even black border, which occupies nearly half of the outer portion of the wing; a black cell-spot and black veins; cilia grey. Underside paler grey, with very broad black borders to both wings: fore wings with a black discoidal spot and another above it close to the costa: hind wings with a large black discoidal spot.

Expanse of wings  $1\frac{1}{2}$  inch.

*Hab.* Singapore.

Received with several examples of *S. plagifera*, Walker, Journ. Linn. Soc. vii. p. 187 (1864), and described by Walker as a *Thermesia*; type in Mus. Oxon., and apparently overlooked and omitted in Phal. xi.

*Stictoptera wetterensis*, nov.

♂. Fore wing narrow and long, the outer margin very oblique and but slightly convex; head, body, and fore wing dark pinkish grey, thickly irrorated with black atoms: fore wing with a short black linear mark below the cell-end, a shorter one at the end, a transverse similar mark near the hinder angle, a longer similar mark parallel with the costa at the apex, and an obscure blackish mark near the hinder margin one-third from the base: hind wing dull white, the veins black; a fairly broad even black band on the outer margin. Underside dirty white, all the veins black: fore wing nearly all blackish, the whitish part confined to the space below the cell: hind wing with a discoidal black line and blackish borders as on the upperside.

Expanse of wings  $1\frac{1}{2}$  inch.

*Hab.* Wetter Island, South-west Islands; Amboina.

The Amboina examples are almost identical with that from Wetter; when more material comes to hand the genitalia must be examined to determine its exact position.

*Stictoptera tongloana*, nov.

♂. Head, body, and fore wings greyish brown with a slight pinkish tinge: fore wings with a number of indistinct, transverse, blackish, waved lines; a black spot inwardly white-edged at the end of the cell, a small black mark below the cell beyond its middle, another rather larger beyond it, with a small one above it continued upward in a waved linear form to near the costa, a similar submarginal disjointed row of black marks, and two black round spots at the apex; all the other marks more or less lunular and encircled by a paler ground than that of the rest of the wing; a row of pale blackish lunules, inwardly pale-edged, close to the outer

margin, and small dark black lunules, inwardly pale-edged, on the margin: hind wings smoky white, veins black; a very broad, even, black marginal band, occupying one-third of the wing-space; cilia white. Underside much as in *wetterensis*.

Expanse of wings  $1\frac{1}{2}$  inch.

*Hab.* Tonglo, Solomon Islands.

*Stictoptera dispar*, nov.

♂ ♀. Palpi, head, body, and fore wings dark chocolate-brown, nearly black; palpi grey in front: fore wing with the base and outer portions slightly paler, markings very indistinct; a transverse, somewhat oblique, and very indistinct band, postmedial, parallel with the outer margin, and beyond the reniform, a paler band adjoining its outer side somewhat reddish-tinged, with some obscure black spots in it, and black lunular marks on the margin: hind wings smoky white, the veins black; outer margin broadly and evenly black, occupying more than one-third of the wing. Underside of the usual pattern, but the fore wing has four rather prominent white spots on the costa before the apex, and the hind wing a prominent discal lunular bar which runs up to the costa.

Expanse of wings  $1\frac{9}{10}$  inch.

*Hab.* Mt. Kebea, Brit. N. Guinea, 6000'.

I have four examples which I received as *S. macromma*, Snellen (from Celebes), but they do not correspond with Snellen's figure or description, or with Hampson's description in Phal. xi. p. 162.

*Stictoptera commutata*, nov.

♀. Fore wings much as in *dispar*, but there is a very large round white spot below the cell at the base of vein 3, which slightly enters the cell and also slightly crosses vein 2; at the base of the wing there are some dull ochreous scales and dull ochreous hairs covering the upper sides of the thorax, two spots behind, and some on the first two segments of the abdomen: hind wings and underside as in *dispar*.

Expanse of wings  $1\frac{9}{10}$  inch.

*Hab.* Mt. Kebea, Brit. N. Guinea, 6000'.

Two examples.

Family Epiblemidæ.

*Epiblema rhacina*, nov.

♂. Upperside of a uniform olive-brown colour: fore wing with the basal half of the costa irrorated with dark brown; a

double ring-shaped mark somewhat like a figure of 8 in the cell, another at its end, and a third below the end, the last two more or less connected; the basal half of the fore wing is finely striated with brown thin striations; there are indications of an outwardly curved brown antemedial line on the fore wing, and a sinuous outwardly curved middle line connected with the two outer ring-marks; both wings with a postmedial line, sinuous in the fore wing, its upper half very deeply outwardly curved, double on the hind wing, waved and very slightly outwardly curved; a row of submarginal brown spots on both wings; outer margin of the fore wing somewhat excavated below the apex as in *E. moza*, Butler\*, but not so deeply, and the two tails of the hind wing blunt and very short. Underside pale pinkish grey, both wings with discoidal marks, double brown transverse lines rather close together, and minute submarginal spots.

Expanse of wings  $1\frac{2}{10}$  inch.

*Hab.* Khasia Hills.

### Family Pyralidæ.

#### *Crithote horridipes*.

*Crithote horridipes*, Walker, Journ. Linn. Soc., Zool. vii. p. 183 (1864).  
*Selenis crinipes*, Snellen, Tijds. voor Ent. xxiii. p. 109, pl. viii. figs. 4, 4a (1880).

Type, Sarawak, Borneo, in Mus. Oxon.

Type *crinipes*, Bonthain, Celebes, in coll. Snellen.

Apparently a very widely distributed species. I have it from Gilolo, the Khasia Hills, and from N. Kanara, S. India; there is no appreciable difference in any of them.

#### *Avitta subsignans*.

*Avitta subsignans*, Walker, xv. 1675 (1858).

*Oroba surrigens*, Walker, Journ. Linn. Soc., Zool. vii. p. 81 (1864).

*Epizeuxis inductalis*, Snellen, Tijds. voor Ent. xxiii. p. 130 (1880), and xxiv. p. 68, pl. vi. fig. 8 (1881).

*Avitta fasciosa*, Moore, Descr. Ind. Lep. Atk. p. 194, pl. vi. fig. 26 (1882).

Type, Kanara, S. India, in B. M.

Type *surrigens*, Sarawak, Borneo, in Mus. Oxon.

Type *inductalis*, Makassar, Celebes, in coll. Snellen.

Type *fasciosa*, Khasia Hills, in coll. Staudinger.

Another widely-spread species. Snellen records it from Java, and I have received it from Sumba Island, Java, Gopong, Perak, Coomoo (Queensland), the Andaman Islands,

\* Ann. & Mag. Nat. Hist. (5) i. p. 402 (1878).



Bombay, Nilgiri Hills, and the Khasia Hills—all apparently identical; whether the examination of the genitalia will bear this out remains to be proved.

*Osericana albistella*.

*Osericana albistella*, Walker, xxxiv. 1214 (1865).

*Pinacia pupillalis*, Snellen, Tijds. voor Ent. xxviii. p. 7, pl. i. fig. 7 (1885).

*Hab.* Sumatra.

Both types are from Sumatra. I have also a pair from Nias. The fore wing of the male is much paler than that of the female, the hind wing of both sexes very pale in colour.

*Osericana albistella trypheropa*, nov.

♂ ♀. Both wings of a uniform purplish grey, the hind wing perhaps a shade lighter in colour than the fore wing, the pectinations of the long antennæ more robust than in *albistella*, the markings similar.

Expanse of wings, ♂ ♀,  $1\frac{9}{10}$  inch.

*Hab.* Palawan, Philippines; 1 ♂, 3 ♀.

*Osericana albistella syntypistis*, nov.

♂ ♀. Uniformly smaller than either of the foregoing forms; the colour of the hind wing about the same as in *trypheropa*, the colour of the fore wing very much darker; the abdomen with more greyish suffusion, the yellow anal tuft entirely black on the upperside; in the other two forms there are only a few blackish hairs.

Expanse of wings, ♂  $1\frac{7}{10}$ , ♀  $1\frac{2}{10}$ – $1\frac{6}{10}$  inch.

*Hab.* Lawang, E. Java; 1 ♂, 4 ♀.

*Simplicia schaldusalis*.

*Bocana schaldusalis*, Walker, xvi. 180 (1858).

*Culicula himarginata*, Walker, Journ. Linn. Soc. vii. p. 178 (1865).

*Simplicia infausta*, Felder, Reise Nov., Lep. pl. cxx. fig. 45 (1873).

*Naburtha marginata*, Moore, Lep. Ceylon, iii. p. 234, pl. clxxvii. fig. 2 (1885).

*Simplicia griseolimbalis*, Snellen, Tijds. voor Ent. xxix. p. 47, pl. ii. fig. 4 (1886).

*Hab.* Walker's and Felder's types are from Sarawak, Borneo, Moore's from Ceylon, and Snellen's from Sumatra. It appears to be a very widely spread form; I have it also from the Solomons and from Obi Island in the Moluccas, and without examining the genitalia I can find no difference between them.

Family **Pyraustidæ.***MARGARONINÆ.**Margaronia alboscapularis*, nov.*Glyphodes alboscapularis*, Kenrick, MS.

♂ ♀. Upperside: head and shoulders black; a white spot on the collar; body black, a short tuft of white hairs on each side from the base of the thorax: fore wings black; a white spot below the costa a little before its middle; a large, oval, discal white patch as in *M. doleschali*, Lederer: hind wings white, with a broad black band, narrowest on the costa, very broad at the apex, narrowing somewhat hindwards to the anal angle. Underside: palpi and body white; abdomen of the male with some black marks, anal tuft black, of the female with the lower half black; legs white.

Expanse of wings, ♂ ♀,  $1\frac{3}{10}$ – $1\frac{4}{10}$  inch.*Hab.* Ekeiki, Mt. Kebea, Brit. Cent. N. Guinea.

A fine series of both sexes, allied to *M. doleschali*, Lederer, but is easily distinguishable by its white hind wings, *doleschali* having black hind wings, with a very large, almost round, white spot.

*SYLEPTINÆ.**Sylepta zarialis*, nov.

♂. Cream-coloured, almost pure white, but not shining; palpi chocolate-brown above: fore wing with the costa pale chocolate, outer marginal fine line, and a little apical suffusion of the same colour very pale: hind wing with the outer marginal line very faintly touched with the same tint of colour; otherwise the head, body, wings above and below, and the legs without any markings.

Expanse of wings, ♂, 1 inch.

*Hab.* Dinawa, 4000', Brit. N. Guinea.*PYRAUSTINÆ.**Aphytoceros subflavalis*, nov.

♂. Pale yellow; head and body without markings; abdomen with the anal tuft black; a small brush of yellow hairs in its middle. Wings above uniform pale yellow, markings pale chocolate-brown: fore wing with two outwardly oblique sinuous lines, two more antemedial, more close together; a dot in the cell, two short lines from the costa across the end of the cell, curved towards each other, with a darker line between

them; two more or less sinuous lines from the inner end of the above, straight to the hinder margin, slightly more separated hindwards; two postmedial lines from the costa to a little below vein 2, somewhat separated from each other at the costa, connected near its end by a thin sinuous line with the lower end of the discoidal lines, and four small rings attached to the outer half of these two lines; some marginal spots and a little suffusion below the middle of the space between: hind wing with a dark lunular line at the end of the cell; two lines from the middle of the costa extending hindwards towards the anal angle, the lines anastomosing halfway down; a sinuous line from the costa near the apex to the anal angle, where it somewhat thickens; some suffusion at the apex of the wing; both wings with dark marginal line and yellow cilia, interlined by a pale brown line. Underside pale glistening yellowish white, the markings of the upperside more or less indicated. Body and legs yellow without any markings.

Expanse of wings, ♂,  $1\frac{7}{10}$  inch.

*Hab.* Arfak Mts., 6000', N. New Guinea.

Not unlike a very large *Margaronia caesalis*, Walker.

### XXXI.—*The Lemurs of the Hapalemur Group.*

By R. I. Pocock, F.R.S.

#### *On Hapalemur and Prolemur.*

IN addition to the skeleton and skull of the *Hapalemur simus* described by Beddard (P. Z. S. 1901, pp. 121–129), the Zoological Society's collection contains the following materials of *Hapalemur*, all the specimens being labelled *H. griseus*, Madagascar, without nearer locality:—

1. The skull of an adult but small specimen, without history of any kind.
2. The skin of a small, probably immature, male specimen which was received in Nov. 1887, and has never been described.
3. The skin of the adult male described by Beddard (P. Z. S. 1884, pp. 391–399), and later by Bland Sutton (P. Z. S. 1887, p. 369).
4. The skin and skull of an adult male dated June 9th, 1903, to Sept. 17th, 1904, which like no. 2, has never been described.

This paper is based primarily upon an examination of these examples.

The two species above named have quite an extensive literature. Skulls assigned to *H. griseus* have been figured on several occasions. To these and to the specimens in the Society's collection I shall revert later.

Good figures of the skull of *H. simus* have been published, notably by Gray (P. Z. S. 1870, pp. 829-830, figs. 1-4), by Jentink (Notes Leyd. Mus. vii. 1885, p. 33), by Milne-Edwards and Grandidier (Hist. Nat. Madag. Mamm., Atlas ii. pls. cxxii. G & H, 1890-1896), and by Elliot (Mon. Primates, i. pl. xvii., 1912); and it may be noted that these figures attest no structural variations of moment, suggesting that more than one form has been described under the name *simus*. As I shall presently attempt to show, this is not the case with skulls ascribed to *H. griseus*.

The generic name *Hapalemur*, proposed in 1851 by I. Geoffroy for the species then known as *Lemur griseus*, met with universal and unchallenged acceptance until 1912, when Elliot, misled by a superficial inspection of the text, substituted *Mioxicebus*—emended to *Myoxicebus*—on the alleged, but entirely erroneous, grounds that Lesson in 1840 had given the latter title to the type-species of *Hapalemur*. It is quite true that the first species cited under *Mioxicebus* was named *griseus*; but it is equally and obviously true that the diagnoses, both generic and specific, of *Mioxicebus griseus* have no applicability to *Hapalemur griseus*. On the contrary, they fit tolerably closely the species for which they were intended, namely, *Chirogaleus major*, then known as *milii*. It is possible that Lesson had at the time a specimen of a different but closely allied species of *Chirogaleus* before him; but until evidence on that head is forthcoming *Mioxicebus griseus* must stand as a synonym of *Chirogaleus major*. *Hapalemur* consequently resumes its former place in literature\*.

\* Another unnecessary change introduced by Elliot into the nomenclature of lemurs is the substitution of the new name *Altilemur* for *Opolemur* on the alleged grounds that Gray applied the latter generic term to *Chirogaleus milii*. That is an incorrect interpretation of the facts. *Opolemur* (P. Z. S. 1870, pp. 853-854) was proposed by Gray for a species represented in the British Museum by specimens which he wrongly identified as *Chirogaleus milii*. That his identification was erroneous is shown by the diagnosis and figures. The characters, stated and illustrated, of his *Opolemur* do not fit *Chirogaleus*; hence the former cannot be a synonym of the latter, as Elliot asserted, and *Opolemur* must be restored to use, if the genus it designates is maintainable, with *Altilemur* as its synonym.

So far as I am aware, the only other name which can come generically into the little group of lemuroid species exemplified by *griseus* of I. Geoffroy is *Prolemur*, which was used by Gray first in a subgeneric, then in a generic, sense for the species he described as *simus*. It appears to me that full generic rank should be assigned to this form. The characters upon which this opinion is based have been either figured or described by previous authors—notably by Gray, Beddard, Milne-Edwards, Grandidier, and Elliot,—who, however, did not attach so much importance as I do to the differences between *griseus* and *simus* where they were appreciated\*. These differences appear to me to be of considerably greater systematic value than those which distinguish such genera as *Chirogaleus* and *Microcebus*, for instance.

To our knowledge of *Prolemur simus* I have nothing to add. In the subjoined comparative diagnoses of *Hapalemur* and *Prolemur* I have merely made use of characters in *Prolemur* which have been stated by others or are apparent in their published figures.

*Hapalemur*, Geoffr.

Type, *griseus*, I. Geoffr.

Gland on forearm present in both sexes.

Nasals long, extending back beyond lacrymal foramina.

Interorbital constriction not exceeding half the width of the post-orbital constriction.

Mesopterygoid fossa much longer than its greatest width in front.

Width across paroccipital processes at most a little greater than length of nasals.

Malar orifice large, set back behind middle of orbit.

Symphysis of mandible strongly curved, chin rounded.

Ramus of mandible slightly everted behind dental line.

Upper  $pm^1$  much lower than canine, a little higher than  $pm^2$ ;  $pm^2$  and  $pm^3$  unlike in size and

*Prolemur*, Gray.

Type, *simus*, Gray.

Gland on forearm present in neither sex.

Nasals short, not extending back to level of lacrymal foramina.

Interorbital constriction considerably more than half the width of the postorbital constriction.

Mesopterygoid fossa shorter than its greatest width in front.

Width across paroccipital processes much greater than length of nasals.

Malar orifice small, set forwards nearly in line with middle of orbit.

Symphysis of mandible not strongly curved, chin flattish.

Ramus of mandible strongly everted behind dental line.

Upper  $pm^1$  slightly lower than canine, much higher than  $pm^2$ ;  $pm^2$  and  $pm^3$  approximately alike

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\* Gray's opinion, for example, that the species described by Schlegel as *Hapalemur griseus* was the same as his *H. simus* attests failure in this respect on his part; and Beddard, when he suggested that Mivart had identified *simus* as *griseus*, must have overlooked that author's description of the teeth.

*Hapalemur*, Geoffr.

form;  $pm^3$  molariform, with quadrate inner lobe;  $m^1$  and  $m^2$  with simple cingulum, without accessory cusp; no trace of groove on the inner cusp of these teeth behind.

Legs shorter; skull about six-sevenths the length of the femur\*.

*Prolemur*, Gray.

in size and form;  $pm^3$  not molariform, with rounded inner lobe;  $m^1$  and  $m^2$  with bilobate cingulum, the posterior lobe cuspidate; the main inner cusp of these teeth grooved posteriorly.

Legs longer; skull about two-thirds the length of the femur.

*On the Species of Hapalemur.*

When *Hapalemur* was instituted two species were assigned to it by Geoffroy—namely, *griseus* and *olivaceus*. The latter was said to differ from the former in colour and in the shape of the lower jaw. Most subsequent authors have concurred in the specific identity of the two, and Milne-Edwards and Grandidier, who had access to Geoffroy's specimens, called *olivaceus* a variety of *griseus*; and their coloured figures show that *griseus* is lighter in tint than *olivaceus*. Elliot, however, admitted the two species because of the difference in colour and the larger size of the skull in *olivaceus*. The inference to be drawn from the literature, whether rightly or wrongly, is that the two forms may represent distinct subspecies, or possibly species, but that in any case they are closely related and exhibit few, if any, constant cranial differences except of size.

The three skins in the Zoological Society's collection are decidedly dark in tint, and may be described as dusky brown, the hairs being dark bluish grey annulated with rusty brown towards the tips. On the crown of the head the rusty brown is more in evidence, but round the eyes and on the cheeks it is less obvious. The underside is lighter than the upper. In the small specimen, received in 1887, the belly and thighs inside are bright buff, the throat grey. In the two others the throat is darker and the belly dark grey washed with brown. Provisionally I regard these skins as belonging to one and the same species and race, and the colouring enforces

\* Judging from M.-Edwards's figures of the skeletons of *H. griseus* and *P. simus*. For instance, in *H. griseus* the skull measures 73 mm. and the femur 90; in *P. simus* the skull is 81 mm. and the femur 120.

In the Zoological Society's specimen of *P. simus* the femur is actually a little longer, being 122 mm. to the head, whereas the skull is shorter, namely, 75 mm. The skeleton, however, is that of an immature specimen, with the last molar teeth still buried in the bone, as Beddard's figure indicates. Probably the skull would have increased in length proportionately much more than the femur.

Unfortunately the leg-measurements of *H. schlegeli* are unknown. Hence the character above stated can only be used provisionally in a generic sense.

the conclusion that they are the *olivaceus*-form of *griseus*, and not typical *griseus*. This conclusion is borne out by the skull of the example received on 9. 6. 03, which is a little larger than the skull of *griseus* figured by Milne-Edwards and Grandidier. It also has the muzzle less steeply inclined, the posterior half of the zygomatic arch a little more arcuate, and the glenoid a little lower with reference to the dental line. I have not sufficient material to judge of the systematic value of these differences. Otherwise the two skulls are very much alike; and it is possible that M.-Edwards's illustration, as suggested below, was taken from an example of what he called the *olivaceus* variety of *griseus*.

I stated above that skulls of specimens assigned to *Hapalemur griseus* have been figured on several occasions; and the figures indicate confusion of more than one form under that name. For instance, if the figure of the skull published by Schlegel be compared with that published by Milne-Edwards and Grandidier, it will be seen that the differences between them fall quite outside the limit of individual variation exemplified by *Prolemur simus* or by any single species of the Lemuridæ known to me. Gray, indeed, declared that Schlegel had drawn the skull of an example of *Prolemur simus* in mistake for *Hapalemur griseus*. With this opinion Beddard was disposed to agree, and Jentink tried to account for the error of this view by explaining that Schlegel's illustration was inaccurate, apparently because it did not agree with the skulls that he possessed. Doubtless it did not; but in my opinion Schlegel's figure was exact in all essential points, seeing that it agrees singularly closely with the adult skull in the Society's collection mentioned first on my list in the opening paragraph of this paper.

Similarly, the skull of the specimen that lived in the Gardens from June 1903 to Sept. 1904 agrees in the main, though not so closely as in the other case, with the skull of *H. griseus* figured by Milne-Edwards and Grandidier. Since these French authors had access to Geoffroy's type of *griseus*, it must be assumed that the example they identified as *griseus* belonged to that form or to *olivaceus*, which was regarded as the same, and that Schlegel's example was wrongly referred to *griseus*. Confirmation of this conclusion was supplied by Elliot, who also saw the specimens in the Paris Museum, and remarked in connection with Schlegel's illustration:—"This figure is badly drawn, or does not represent the skull of *H. griseus*. It is altogether too broad, especially the muzzle." From this passage it seems that Elliot was not prepared altogether to accept Jentink's verdict as to the inaccuracy of

Schlegel's figure, and that the possibility of another species being concerned dawned upon him. Nevertheless, the shortness of the muzzle misled him apparently in the matter of its apparent superior width.

Both the literature, therefore, and the skulls in my possession attest the existence of two well-marked species of *Hapalemur*—one exemplified by the small skull above referred to, which probably belongs to the form Schlegel identified as *H. griseus*, the other being the true *griseus* of Geoffroy, which has been well figured by Milne-Edwards and Grandidier. The former species I propose to describe as new, taking the skull in the Zoological Society's collection as the type. Since the only other skull I have at hand is that of the specimen determined, for reasons already stated, as *olivaceus*, I have diagnosed the new species with special reference to *olivaceus* rather than to *griseus*, although the differences between it and Milne-Edwards's figure of the skull of *griseus* are almost as well marked.

*Hapalemur schlegeli*, sp. n.

? *Hapalemur griseus*, Schlegel, in Pollen & Van Dam, Rech. Faune de Madag., Mamm. et Ois. p. 6, pl. vii. figs. 4 a-d (skull). Nec *H. griseus*, Is. Geoff.

Skull (type) considerably shorter but relatively broader, higher, and more arched antero-posteriorly along its upper profile, and less hollowed between the postorbital processes, than in *H. olivaceus*, the orbits relatively larger, with the inferior edge much more salient, giving a strongly sinuous curvature to the outline of the malar arch, and causing a deeper groove along the outer surface of its suborbital portion; the upper surface of the muzzle more depressed and curved, the upper portion of the maxilla compressed along the nasal suture, the lateral edge of the anterior nares emarginate in profile view, this orifice slightly higher than wide, compressed above. In *H. olivaceus* the muzzle and anterior nares are not compressed above and the latter orifice is slightly wider than high. The zygomatic arch and postorbital bar are relatively stouter than in *olivaceus*; the mastoid is inflated, reducing the paroccipital process, and the upper edge of the zygoma is not continued as a crest back to the occiput as it is in *H. olivaceus*, where the mastoid is not inflated but flat, leaving the paroccipital processes salient. The basicranial axis is more steeply inclined, so that the bullæ and occipital condyles are set considerably lower with reference to the alveolar border of the maxilla than in *olivaceus* \*.

\* This difference is not so marked between the skulls of *H. schlegeli* and *H. griseus*, judging from M.-Edwards's figure of the latter.



Teeth of *H. schlegeli* shorter and narrower.

The typical skull of *H. schlegeli* has fully erupted and complete dentition and the sutures nearly obliterated. The obliteration, however, has not extended to quite the same extent as in the skull referred to *H. olivaceus*. Nor is there in the skull of *H. schlegeli* a median sagittal ridge on the parietal region. The low temporal crests are merely confluent near the middle of the parietals. The difference in this respect may be due to difference of age; but this is uncertain. When the two skulls are placed side by side on a flat surface they are practically the same height, despite the considerable disparity in length.

The differences in the shape and the dimensions of various parts of the skulls may be appreciated from the subjoined table of measurements of the type of *schlegeli* and of my skull referred to *olivaceus*. In the third column are given the dimensions taken from the figures of the skull named *griseus* by M.-Edwards:—

	<i>schlegeli.</i>	<i>olivaceus.</i>	<i>griseus.</i>
	mm.	mm.	mm.
Basal length .....	52	64	60
Length of palate along middle line ....	25	31	29
Length from post. edge of postorb. bar to tip of pmx. ....	36	42	37
Length from post. edge of orbit to lacrymal foramen .....	19	19	19
Height of orbit.....	14	14	14
Height from alveolar border to lower edge of orbit .....	9	12	10.5
Width of cranium .....	31	33	33
Width of postorbital constriction .....	23	19	19
Width of interorbital constriction.....	8	10	10
Width across zygomata (postorbital) ..	44	49	48
Width across orbits.....	39	40	40
Width of muzzle above canines.....	14	17	16
Length of mandible from condyle.....	41	52	48
Width of upper pm <sup>3</sup> .....	4.5	5.5	5

Skulls assigned to *H. griseus* have also been figured by Jentink (Notes Leyden Mus. vii. pls. i. & ii. figs. 3-4, 1885) and by van der Hoeven (Tijds. Nat. Geschied. 1844, pl. i. fig. 1); but in both cases there are discrepancies in the dimensions of the superior and lateral views which make it impossible to tabulate the measurements. For instance, in the case of Jentink's specimen the superior view of the skull is 65 mm., the lateral view 62.5, whereas the lateral view of the mandible from the condyle is 44 and the superior view 40.

In Hooeven's figure the superior view of the cranium is 59, the lateral view is 63. It may be noted that in M.-Edwards's figure of the skull of *griseus* the measurements coincide, as should be the case, both from the lateral and superior aspects.

Turning to Jentink's text, we find it stated that sixteen adult skulls measured 61 mm. in total length and 42 in width across the zygomata. They are thus considerably smaller than the skull of *griseus* figured by M.-Edwards, which is 73 mm. long and 48 broad, while my *olivaceus* is 76 mm. long and 49 broad. Clearly, therefore, Jentink's skulls were considerably smaller than the one depicted by Milne-Edwards and than the one I have described as *olivaceus*. This suggests the possibility of Milne-Edwards having described a skull of *olivaceus* as *griseus*, a course he might very well have adopted, seeing that he regarded *olivaceus* merely as a variety of *griseus*. Again, if the specimen figured by Jentink be a true sample of the sixteen he had for examination, they all differ from my *olivaceus* and Milne-Edwards's *griseus* in having a very much thinner postorbital bar. This, however, like the smaller size, may be a matter of age. Moreover, it will be noticed that the temporal crests are subparallel, showing scarcely any sign of convergence as far back even as the interparietal region, whereas in my *olivaceus* and M.-Edwards's *griseus* these ridges coalesce and form a fairly strong sagittal crest over the middle line of the parietal region.

But, whether Jentink's skulls represent a form distinct from M.-Edwards's *griseus*, or are merely less well-developed individuals of the same species, it is quite clear they are not referable to the same form as the one I have named *schlegeli*. They are too long and narrow, have very slender postorbital bars, and the frontal bones are depressed as in my skull of *olivaceus*.

There is no occasion to publish a figure of the type-skull of *H. schlegeli*, since it is in almost punctilious agreement with Schlegel's illustration, which shows the inflation of the mastoid, the sinuous curvature and suborbital salience of the malar arch, the thickness of the postorbital bar, the large orbits, the cranial width, the curvature of the upper profile, the shortness of the muzzle, etc. One rather marked difference in the tip of the muzzle may be explained, I suspect, by the cutting away of this part of the skull in Schlegel's example when it was removed from the skin. The incisor teeth are missing, as others have remarked, and this defect suggests that a portion of the premaxilla may have been cut away. If so, the ends of the nasals may have been truncated at the same time. This, however, is merely a suggestion. In the

type-specimen also the angle of the mandible is less rounded and the upper end of the coronoid is thinner, longer, and less curved than shown in Schlegel's figure.

The specimen described by Schlegel as *H. griseus* was discovered by Pollen at Ambassuana, three days' journey from the north-west coast of Madagascar. If, as I suspect, the type of *H. schlegeli* belongs to the same species, it probably came from the north-west coast of Madagascar, possibly also from Ambassuana.

### *The Arm-glands of Hapalemur.*

The presence of glands on the forearm in *Hapalemur griseus*—or, rather, *olivaceus*, for such one of the specimens proves to be—was first pointed out by Beddard, who also ascertained, from Jentink and Milne-Edwards, that no such glands are developed in *Prolemur simus*. This character alone is sufficient, in my opinion, for generic separation of the two species.

In the two male specimens of *H. olivaceus*\* in which he described the glands, he pointed out that the naked tract of skin above the wrist was covered with long and coarse papillæ; but, judging from his figures, the papillæ were much better developed in the first specimen examined than in the second.

In the two other skins in the Society's collection, which Beddard did not see—namely, the small one received Nov. 10, 1887, and the adult received June 9th, 1903,—the gland differs in that the tract of integument is comparatively smooth, being merely roughened, so far as can be judged on the dried skin, with fine granular papillæ.

With regard to the glands on the upper arm, regarded by Beddard (but, I think, wrongly) as mammæ, I can find no trace of them in the small and presumably immature skin; and in the adult skin with the glandular tract of the forearm nearly smooth they are less well developed than in the specimen in which they were first detected—namely, the one with the glandular area of the forearm exceedingly coarsely papillate.

I do not think any special importance should be attached to these differences, because in *Lemur catta*, which possesses similar glands, the spur on the glandular tract of the forearm, which may be compared to the papillæ in *Hapalemur*, varies

\* I have the dried skin of the example described by Beddard in 1884. Of the second specimen described in P. Z. S. 1891, p. 449, and 1902, p. 159, no history was given, and the skin was not preserved. Probably it was *olivaceus*.

in development with age, being larger in older specimens, and the gland of the upper arm is, I believe, subject to seasonal changes in size.

The occurrence of similar glands in two such widely different species as *Lemur catta* and *Hapalemur griseus*, and their complete absence in the other species referred to *Lemur* and in *Ptolemur simus*, is a remarkable fact.

### XXXII.—*Some Notes on Three-toed Sloths.*

By OLDFIELD THOMAS.

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To those whose interest it is to compare zoological characters in their relation to geographical distribution no group of Mammals is so unattractive as the sloths, on account (1) of their variability, especially in the skull, in specimens from the same place, (2) the slight and intangible characters that distinguish specimens from the most distant localities, and (3) the great state of confusion that has resulted from the descriptive efforts of Wagler, Gray, and Fitzinger. Early descriptions, without statements of locality, have been made the basis of various names, and it is a matter of the greatest difficulty to disentangle the confusion.

The present notes make no pretence of being complete, and are purposely worded somewhat vaguely, as such are the difficulties of the case that there is hardly a statement I can make which may not prove liable to modification as fuller series from all localities are studied.

Firstly, with regard to genera, I am disposed to recognize the collared sloth, *Bradypus torquatus*, Desmarest, 1817 (not Illiger, as usually quoted, for the latter author's two references are both *nomina nuda*), as forming a special genus, which may be distinguished by the inflated pterygoids, better developed premaxillæ, the median spout-like projection on the mandible, and the absence of a dorsal gland or "speculum" in the male\*, all these characters being as in *Cholapus*. The generic name of *Scaopus*, Peters, is available for it.

\* I can by no means subscribe to Dr. Allen's conclusion (Bull. Am. Mus. xx. p. 339, 1904) that "the presence or absence of this highly differentiated patch is not sexual"—a conclusion based on what I must consider the incorrect sexing of certain "females" by one of his collectors. Not only has it long been generally accepted that the speculum is characteristic of the male, but I find that in *every* specimen without speculum in our collection mammæ are to be found, while in no example with speculum is there any trace of them. With so large a collection, including so many different forms, this evidence appears to me conclusive.

Synonyms of *Scaëopus torquatus* are *crinitus*, Gray, 1849 (ex Browne), and *affinis*, Gray, 1849. The species is confined to South-western Brazil, but the limits of its range are not known. Mr. A. Robert sent a nice series of it to the British Museum from Engenheiro Reeve, Espirito Santo, in 1903.

Passing now to true *Bradypus*, we find the question of the identification of its type-species, *tridactylus*, Linn., a question so productive of confusion among the early writers, has now been settled by the fixation as the typical locality of the latter as Surinam \*—so that the Guianan species should bear the name *tridactylus*.

*B. tridactylus* is the best-marked of the species of the genus, being readily recognizable by the extension of the yellow colour of the face down the front of the neck—a character to which no approach is shown by any other species. Its skull is rather small and has generally a pair of peculiar fossæ or perforations in the floor (or, more strictly, the roof) of the anterior part of the mesopterygoid fossa; but, although so striking in well-marked cases that a person might excusably think it a character of generic value, this modification varies in different skulls, and is sometimes practically absent. The teeth are of average proportional size, the pseudo-canine † well differentiated, and the pseudo-incisor † small, usually about a quarter the size in section of one of the molars.

Wagler (1831) was the first properly to distinguish this species, to which he gave its current name of *B. cuculliger*, while other synonyms of it are *Acheus ai*, Less. ‡ (1827); *guianensis*, Blainv. (1839), a name doubtfully valid technically; *gularis*, Rüpp. (1845); and *cristatus*, Temm., Fitzinger, 1871.

*B. tridactylus* ranges over the whole of Guiana—French, Dutch, and British,—and our collection contains a good series of it, mostly presented by Mr. F. V. McConnell.

\* See Thomas, P. Z. S. 1911, p. 132.

† These names are used respectively for the second and first upper teeth, which, really corresponding to the anterior premolars of ordinary Mammals, take on in the three-toed sloths something of the relative proportions of a canine and an incisor. The three remaining teeth on each side, acting as a premolar-molar series, are subequal, smaller than the pseudo-canine, larger than the pseudo-incisor.

‡ This name was given to the "*Bradypus tridactylus*, L.," of Desmarest, which included all the forms of true *Bradypus* then known. It seems best placed as a synonym of *tridactylus*, especially as the animal is said by Desmarest to be very common in Cayenne. For the Brazilian *Ai* of Marcgrav it would be the earliest name, but there would be difficulty in justifying its use for that animal on technical grounds.

South of Guiana, from Para to Rio, and westwards up the Amazon, there occur a very uniform series of forms which may or may not be divisible into two or more species, but which it is impossible at present to clear up without many more sets of specimens. One locality only—Para—is well represented, as M. Robert got a series there in 1904.

Throughout this area the sloths are rather larger than *B. tridactylus*; the speculum is of normal size, as in that species, and of a rather less dark yellow colour, the general colour is brown mottled to a very variable extent with white, and the band of yellow velvety hair which passes across the forehead is usually about half an inch in breadth—say, 10–15 mm. The skull averages rather larger than that of *tridactylus*, and has generally a much inflated frontal region. The floor of the mesopterygoid fossa is usually flat, with or without median septum, and without special perforations. The teeth, although variable, are usually of what may be called normal proportions, the pseudo-incisor smaller—generally much smaller—than the molars, and the pseudo-canine decidedly larger than the latter.

The names for these sloths may be put in two groups—the Amazonian and the S.E. Brazilian—not that as yet I can see any valid reason for distinguishing the two specifically, but merely to help later workers.

(1) Amazonian: *B. infuscatus*, Wagl. 1831 (Brazil near Peruvian boundary); *brachydactylus*, Wagn. 1855 (syn. *speculiger*, Fitz. 1871) (Borba, Lower Madeira); *problematicus*, Gray, 1849 (Para); *unicolor*, Fitz. 1871 (Para); *smithii*, Gray, 1869 (Para). *B. marmoratus*, Gray, 1849 ("Brazil"), seems also to belong here, judging by the type, and, if the Upper Amazon *infuscatus* proves distinguishable, would be the first name for the Lower Amazon form.

(2) S.E. Brazilian: *B. ai*, Wagl. 1831, nec Less. 1827 (R. Matheus, Espirito Santo); *brasiliensis*, Blainv.\* 1839 (Rio Janeiro); *pallidus*, Wagn. 1843 (Rio Janeiro); *blainvillei*, Gray, 1849 (Brazil); *dorsalis*, Fitz. 1871 (Pernambuco—based on Marcgrav).

Series from many localities are needed before these Brazilian sloths can be properly worked out, the available specimens—apart from M. Robert's set from Para already mentioned—consisting of isolated examples, often without any exact locality at all.

*Bradypus boliviensis*, Gray, 1871 (type B.M. no. 46.7.28.24), seems to be a valid species. Its speculum is of medium size,

\* Put in valid form on p. 64 of the article on *Bradypus*.

rather dark-coloured. The hairs of its throat are tipped with white, a point not seen in any other species, though probably not of great constancy. Its skull is large and solidly built, and the teeth are distinguished by the unusual character that the pseudo-incisor is very large—as large as or even larger than the pseudo-canine, which in turn is small, not exceeding the posterior molars in transverse section. These tooth-characters are, however, not to be seen in Gray's figure, which seems to have been taken from a wrong specimen. But that 46.7.28.24 is the proper type there can be no doubt, as its osteological number, 921. *a*, is quoted by Gray.

In Central America we have *B. castaneiceps*, Gray, 1871, of Nicaragua, and *B. griseus*, Gray, 1871, of Veragua, of which we have no further material, and I can add nothing to Alston's account of them except to note that Mr. Goldman considers them really distinct, and adds to them a third species—*B. ignavus*, from Panama and the Atrato River. It is, however, certain that *griseus* and *ignavus* at least are very closely allied to *B. flaccidus*. It is also to be observed that Dr. Allen has identified a sloth from Rio San Jorge, Bolivar, Colombia, with Philippi's *B. ephippiger*; and as an example from Condoto, Choco, Colombia, presented by Dr. Spurrell, agrees with Philippi's figure in the great size of the speculum, the breadth of the frontal band, the distribution of the light and dark face-markings, and the size of the teeth, I am disposed to accept Dr. Allen's identification, and put down *ephippiger*, which was described without exact locality, as a native of N.W. Colombia, therefore in the same region as "*B. ignavus*" came from.

In any case, however, the relations to each other of *griseus*, *ignavus*, *ephippiger*, and *flaccidus* clearly need much further investigation.

*B. flaccidus*, Gray, 1849, has as type-locality Venezuela (probably the region opposite Trinidad), and has as synonyms *dysoni*, Gray, 1869, and *columbicus*, Fitz., 1871.

But by what characters it can be positively distinguished from the Brazilian forms I have not sufficient good material to be certain.

From Ecuador the Museum contains, firstly, a set of five adults and two young from Sarayacu on the Upper Pastaza River, and, secondly, an adult from the Balzar Mts., Guayas district, W. Ecuador. These appear to me to represent two forms for which no names are available. The first may be called

*Bradypus macrodon*, sp. n.

Most nearly allied to *B. infuscatus*, but the teeth heavier.

General colour pale brown, the white marbling of the posterior back generally extensive, with a well-marked brown median line, but in one specimen there is scarcely any white, and in another but little. Face and chin brown, the light frontal band narrow, about half an inch (say, 10–15 mm.) in breadth, whitish rather than yellow in most of the specimens. Hairs on crown overhanging the frontal band rather darker than those on the body generally. Speculum of medium size,  $2\frac{1}{2}$  inches long in the type, paler yellow than in most other species, its median black band broad. Limbs freely marbled with white.

Skull much as in *B. infuscatus*, the forehead rather less convex than usual. Nasals, as usual, quite variable in shape and length, some convex and some concave anteriorly. Interparietal also extremely variable, its antero-posterior diameter in the type 15 mm., and in another specimen 7 mm. Mesopterygoid fossa widely open, its floor smooth and flat, or with a slightly raised median ridge, but without deep pits or excavations.

Teeth very large, much heavier than in *infuscatus*. Pseudo-incisor very large, oval in transverse section, the longest diameter pretty well equalling that of the molars, 4.3 mm. in the type, 5 mm. in another specimen. Pseudo-canine similarly very large and heavy, its greatest diameter about 6.2 mm., far exceeding the molars in bulk. Molars rarely less than about 5 mm. in greatest diameter.

Skull-dimensions of type:—

Naso-occipital length 78.5 mm.; condylo-basal length 78.3; greatest breadth (on squamosal) 56; nasals, length 12.5, least breadth 12.3; interorbital breadth 25.5; palate length from gnathion 29; postpalatal length 43; tooth-series 29; breadth between outer sides of pseudo-canines 22.6.

*Hab.* Sarayacu, Upper Pastaza River, Oriente of Ecuador.

*Type.* Adult male. B.M. no. 80. 5. 6. 56\*. Collected by Clarence Buckley. Seven specimens examined.

This species is no doubt most nearly allied, as is natural, to *B. infuscatus*, but differs by the materially larger size of the teeth. Even in this character, however, one specimen fails (skull no. 80. 5. 6. 59); but among sloths such variations must be expected.

\* The skulls were not individually allocated to the skins when they came, but I think there is little doubt as to the reference to each other of the type-skin and skull.



*Bradypus violeta*, sp. n.

Allied to *B. macrodon*, but distinguished from that, as from every other sloth, by the great extent of the yellowish velvety hair of the face, which extends upwards on the crown to the level of the ears nearly 60 mm. from its anterior commencement; the hairs of the cheeks as far as the ears also of the same colour and quality. Sides of throat likewise inclining to yellowish, in continuity with the cheeks, but the chin dark brown as usual, and the dark eye-streak also present. Nape, shoulders, and middle line at withers brown, the rest of the back nearly wholly white, as are also the hind limbs. Fore limbs brown, marbled proximally with white. Under surface dark brown anteriorly, whitish brown posteriorly. Speculum not known, the only specimen being a female.

Skull like that of *B. macrodon*, the forehead a little more swollen. Teeth of similar size and proportions.

Skull-measurements of type:—

Naso-occipital length 72 mm.; greatest breadth (on jugal) 49·5; nasals, length 14, least breadth 12·3; interorbital breadth 24; palate length from gnathion 28·5; tooth-series 27·2; breadth between outer corners of pseudo-canines 20; greatest diameter of pseudo-incisor 4, pseudo-canine 6, second molar 4·8.

*Hab.* Balzar Mountains, Guayas, W. Ecuador.

*Type.* Adult female. B.M. no. 80. 5. 6. 83. Collected by Mr. Illingworth.

Characterized by its nearly wholly velvet-clothed face.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

January 24th, 1917.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

Mr. SCORESBY ROUTLEDGE, M.A., gave an account of Easter Island. He said that the Expedition, that he had had the honour to command, was organized with the object of carrying out a long-standing wish of various bodies interested in anthropology. This wish was that Easter Island, and other islands most near to it, though far distant from it, should be thoroughly examined, and that all information and material thereon found should be carefully considered on the spot, or, if possible, be brought back for comparative study.

This programme necessitated a vessel being specially designed, built, and equipped for the purpose. A schooner with auxiliary motor power, the 'Mana,' of 90 tons gross register, 78 feet

on the water-line, 20 feet beam, and drawing 10·5 feet aft, was accordingly completed by the end of 1912, and she sailed from Southampton in February 1913 with a company of twelve all told, of whom four formed the scientific staff. After the longest voyage ever made by a yacht under canvas, she sailed into Southampton again in June 1916, without having experienced accident to man or material.

The course taken was through the Magellan Straits, and thence through the labyrinth of Andean waterways that stretch north therefrom, and are known as the Patagonian Channels.

On reaching Juan Fernandez Island, the 'Mana' had to put back to Valparaiso because the geologist of the Expedition, the late Mr. F. L. Corry, had contracted typhoid fever on the Chilean coast. Mr. Corry never recovered sufficiently to allow him to rejoin the Expedition. Hence no formal geological report on the island could be submitted to the Meeting. It was thought best, therefore, to endeavour to convey the conditions existent on Easter Island by means of a series of panoramic and other photographs, specially taken to illustrate geological features. As these very largely consist of coast-sections, the opportunity was taken to show, and explain, other pictures that were closely associated with them. Such were the ruins of the village called Orongo, consisting of peculiar canoe-shaped houses built of imbricated slabs of shale, with the roof convex, both longitudinally and transversely, on its exterior aspect, and covered with earth. They are romantically situated on the rim of the volcano of Rano Kao, with an almost sheer drop of 900 feet into the sea, or of 600 feet into the crater-lake. At Orongo, too, are found certain large rocks, carved with the symbol of a bird-headed man, holding in its hand an egg. A cult, based on annually obtaining the first-laid egg of a certain migratory sea-bird, was thus gradually brought to light, and appears to be a unique form. A brief outline only could be given of some of the knowledge obtained concerning the peculiar routine associated with seeking, and taking, the sacred egg, and of the part which it occupied in the former religious life of the island.

Proceeding along the coast, typical examples of the great terraces, and their giant stone figures, were shown, and their leading characteristics discussed. A submarine freshwater spring, near the great image-terrace of Tongariki, and opposite certain typical lava-formed caves, gave occasion to the lecturer to explain how had arisen the longstanding, and world-wide spread report, that man and beast on Easter Island habitually drink sea-water, in the place of fresh.

The old volcano of Rano Raraku, the centre of the former religious life of the island, was then described. A series of panoramic pictures, preceded by an accurate survey made by Lieut. R. D. Ritchie, R.N., the Cartographer of the Expedition, showed a crater-lake surrounded by a rim of tuff which rises to a height of 540 feet above the surrounding plain. The plain is undulating in surface, formed superficially of hard, dense, but nevertheless vesicular, lava, and it rests on compact non-columnar

basalt. One section of this crater wall, some 600 yards long, on both its interior and exterior aspects, was seen to be quarried right up to the highest point. On the mountain-face, both inside and out, large numbers of statues, in every state of completion, were to be seen. The largest of these measured 68 feet in length. Some of those excavated by the Expedition exhibited fine details, such as the finger-nails, in perfect condition.

In conclusion, Easter Island might be described as a plateau of basalt raised from 50 to 100 feet above the sea. Superimposed on this were numerous cones ranging up to nearly 2000 feet. The plateau was covered but sparsely with soil, and could only be crossed with difficulty in any direct line. The cones, on the other hand, were generally smooth of surface, with a good depth of soil. Nevertheless the island is practically without trees, bushes, or shrubs.

February 7th, 1917.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

The following communications were read :—

1. 'The Trias of New Zealand.' By Charles Taylor Trechmann, M.Sc., F.G.S.

The fossiliferous Triassic rocks of New Zealand have been wholly or in part at different times attributed by the geologists of that Dominion to a Devonian, Permian, Permo-Carboniferous, Lower, Middle or Upper Triassic, or Trias-Jura age. A review of the previous research on these rocks and of their correlation and nomenclature is given. They are quite distinct from the Matai rocks, which contain a Permo-Carboniferous fauna.

Triassic beds appear at intervals from Kawhia on the western coast of the North Island to Nugget Point on the south-eastern coast of the South Island—a distance of 620 miles. Except in two localities, they are everywhere very steeply inclined, and where they approach the Alpine Chain of the South Island pass into semi-metamorphic greywackes or completely metamorphic phyllites and schists. They are of great thickness. A short description of the special faunal, lithic, and tectonic features of each of the more important localities is given, all of which but one occur in the South Island. In the North Island only the Noric and Rhætic horizons have been recognized. Wherever the sequence is preserved, the Trias passes conformably up into Jurassic deposits.

The lowest fossiliferous horizon of the Trias occurs near the top of a great thickness of greywackes and conglomerates called the Kaihiku Series, and is separated by several hundred feet from the next fossiliferous beds above it. The Kaihiku fossils are scanty in species, and no cephalopods occur. Among those restricted to this horizon is *Daonella indica* Bittner, which occurs in Ladino-Carnic deposits in the Himalayas and in the Malay Archipelago. Members or survivors of a Muschelkalk fauna occur in the form of *Spiriferina* of the group of *Spiriferina fragilis* Schlotheim. It is concluded that the Kaihiku fossil

horizon is either late Middle or early Upper Trias, and the great unfossiliferous series below it represents the Middle and possibly Lower Trias.

The most highly fossiliferous division is the Carnic—the Oreti and Wairoa Series of New Zealand geologists. Several ammonites occur, among which *Discophyllites* cf. *ebneri* Mojsisovics is found in the Carnic and Lower Noric of the Himalayas. The *Halobia* include *H. zitteli* Lindström, a Spitsbergen fossil, together with *H. hochstetteri* Mojsisovics and *H. austriaca* Mojsisovics. Several of the Carnic fossils show affinities with European Alpine forms, and can be used for purposes of correlation.

The Noric horizon, the Otapiri Series in part, is represented by felspathic sandstones containing immense quantities of *Pseudomonotis*, a genus which characterizes the Noric in all the Circum-Pacific Trias. *Ps. richmondiana* Zittel is known only from New Zealand and New Caledonia; but the Author found the Asiatic, Siberian, and Japanese form, *Ps. ochotica* Teller, in all its varieties, in very high Noric beds near Nelson.

The Rhætic, the upper part of the Otapiri Series of local geologists, comprises a great thickness of sandy and pebbly beds. Its fossils include an extremely-alate *Spiriferina* and a group of specialized bisulcate Spirigerids. An Arcectid of Rhætic aspect was collected high up in these beds at Kawhia.

Forty-seven genera and species of molluscs and brachiopods are recorded in the present paper, of which three genera and forty-one species are regarded as new.

The brachiopods are of considerable interest, and exhibit phylogerontic tendencies in several of the groups as they approach extinction.

The affinities of the New Zealand Trias with that of the Malay Archipelago, and especially of New Caledonia, is discussed; and it is shown that the faunal transgression which occurred over those regions, at or shortly before the commencement of Upper Triassic times, extended also to the area now occupied by New Zealand.

2. 'The Triassic Crinoids from New Zealand collected by Mr. C. T. Trechmann.' By Francis Arthur Bather, M.A., D.Sc., F.R.S., F.G.S.

The specimens are all from the Kaihiku Series, and comprise:— (1) an *Entrochus* from near Nelson, with a broadly waved suture; (2) a rock-fragment from the Hokanui hills, containing imprints of columnals and brachials representing two genera: namely, (a) an *Entrochus* with ridges of the joint-face arranged in pairs separated by shorter ridges; (b) an *Isocrinus* of the group of *I. dubius* (Goldfuss). Comparison of the three new species based on all these remains with the Triassic crinoids described from Europe and especially with those from North America, leads to the conclusion that they are of Upper Triassic age. They bear, however, no resemblance to the Upper Triassic crinoids from Timor, which the Author has in hand for description.

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[EIGHTH SERIES.]

No. 113. MAY 1917.

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XXXIII.—*Descriptions of New Pyralidæ of the Subfamilies*  
*Hydrocampinæ, Scoparianæ, &c.* By Sir GEORGE F.  
HAMPSON, Bart., F.Z.S., &c.

THE numbers attached to the species in the following paper refer to my classification of *Hydrocampinæ* and *Scoparianæ* in the Trans. Ent. Soc. 1897, pp. 127-240, and to subsequent supplementary papers in the Ann. & Mag. Nat. Hist.

### *EPIPASCHIANÆ.*

Genus *PLUTOPASCHIA*, nov.

Type, *Stericta sinapis*, Roths.

Proboscis fully developed; palpi upturned, the 2nd joint reaching to vertex of head, the 3rd rather long. Antennæ of female minutely ciliated; tibiæ smoothly scaled. Fore wing narrow, the apex rounded, the termen evenly curved; vein 3 from before angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9, 10 coincident; 11 from cell. Hind wing with veins 3 and 5 shortly stalked, 4 absent; 6, 7 from upper angle of cell, 7 anastomosing with 8.

Genus *GEROPASCHIA*, n. n.

*Aræopaschia*, Hmps. n. n. (8) xviii. p. 134 (1916), nec Hmps. 1906.

Type, *G. grisealis*.

*Ann. & Mag. N. Hist.* Ser. 8. Vol. xix.

24

## CHRYSAUGINÆ.

*Murgisca mesozonalis*, sp. n.

♀. Head, thorax, and abdomen whitish; patagia and abdomen above tinged with rufous. Fore wing pale greenish yellow; a silvery-white fascia on base of inner area bounded above by a rufous line; a medial silvery-white band from upper angle of cell to inner margin bounded by rufous and constricted at lower angle of cell and vein 1. Hind wing ochreous yellow; cilia of both wings silvery white.

*Hab.* W. AUSTRALIA, Sherlock R. (Clements), 2 ♀ type, Roebourne. *Exp.* 22 mm.

## PYRALINÆ.

*Pyralis costinotalis*, Hmps. A. M. N. H. (8) xix. p. 67 (1917).

*Hab.* FORMOSA, Arizan (Wileman), 2 ♂ type. *Exp.* 24 mm.

## HYDROCAMPINÆ.

(1a) *Gargela niphostola*, sp. n.

♀. Head, thorax, and abdomen silvery white, the last dorsally suffused with red-brown except on two basal segments; palpi with the 2nd joint golden brown behind; fore femora and tibiae suffused with golden brown, the tarsi ringed with brown towards extremity; ventral surface of abdomen tinged with golden yellow. Fore wing silvery white; a faint curved brownish postmedial line; a blackish point on termen below apex. Hind wing uniform silvery white. Underside silvery white; the fore wing with a black point on termen below apex.

*Hab.* D'ENTRECASTEAUX Is., Fergusson I. (Meek), 1 ♀ type. *Exp.* 18 mm.

(6) *Gargela obliquivitta*, sp. n.

Mid tibia of male dilated with a fold and tuft of long hair and fringed with hair above.

Head, thorax, and abdomen silvery white; antennae brown except above; palpi behind, except the 3rd joint, and base of maxillary palpi dark brown; fore legs tinged with ochreous, the femora at extremities, tibiae near extremities and tarsi banded with black-brown. Fore wing silvery white; a golden-orange medial line, oblique to upper angle of cell, then inwardly oblique and faint; a golden-yellow tinge from end of cell to medial part of termen; an oblique golden-orange line from costa well beyond middle, where it is dilated into a small wedge-shaped mark to discal fold near termen, an oblique golden-orange wedge-shaped mark beyond it from costa to discal fold just before termen; a cupreous-brown terminal line from apex to discal fold, and a double cupreous-brown striga before termen.

above vein 3; cilia white, metallic golden at tips, with cupreous-brown line at base from vein 4 to submedian fold, and wholly tinged with gold towards tornus. Hind wing uniform silvery white.

*Hab.* MOLUCCAS, Batchian (*Doherty*), 1 ♂, 1 ♀ type. *Exp.* 16 mm.

(5 b) *Argyractis leucostola*, sp. n.

Fore wing of male with small fovea below the costa beyond middle and vein 11 distorted.

Head, thorax, and abdomen silvery white; fore tibiæ black at base and extremity. Fore wing silvery white, the costa suffused with blackish brown to end of cell; a reddish-brown spot in end of cell and oblique black-brown line from median nervure near end of cell to inner margin, diffused on inner side; a brown discoidal striga and oblique line from it to inner margin; postmedial line double, black-brown filled in with yellow and oblique to vein 3, then single, retracted with an upwards curve to lower angle of cell, then strongly excurved to inner margin, its sinus filled in with yellow; a terminal yellow band, arising just below apex, its inner side defined by a black-brown line to above vein 2 and its outer by black points, a silvery spot defined by brown before termen below vein 2. Hind wing silvery white; a sinuous black-brown line from middle of costa to tornus, with a yellow patch before it below the cell; a double slightly sinuous black-brown line from costa just before apex to submedian fold, excurved below costa and filled in with yellow below vein 3; a yellow terminal band from apex to submedian fold, defined on inner side by a waved black line except at apex; cilia with a brown line at base to vein 2.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 2 ♂, 5 ♀ type. *Exp.*, ♂ 18, ♀ 22 mm.

(13 a) *Argyractis flavivittalis*, sp. n.

♂. Head, thorax, and abdomen whitish mixed with some red-brown; antennæ red-brown; fore tarsi with brown bands towards extremities. Fore wing silvery white, the costal area suffused with brown; a brown antemedial line defined on outer side by white, incurved from below costa; a medial brown line defined on outer side by white, incurved below the cell; a small brown discoidal spot; postmedial line silvery white, defined on inner side by brown from costa to vein 4, then angled inwards to median nervure before end of cell, then oblique and defined on inner side by brown to tornus, with a wedge-shaped yellow patch above it from lower angle of cell to below its angle at vein 4; a silvery-white subterminal line defined on each side by brown from costa to vein 2 and a small brown spot with silvery-white mark before it below vein 2; cilia brown at base, whitish at tips. Hind wing white, the end of cell and the area beyond it from costa to vein 3 yellow; a silvery discoidal bar defined on inner side by a brown striga; postmedial line silvery white and oblique from costa to vein 3; a terminal black patch from below

apex to vein 2, with four ocelli on it with black centres defined on inner side by white and on outer by golden yellow; cilia white with brown line near base from apex to vein 2.

*Hab.* PERU, San Domingo (*Ockenden*), 1 ♂ type. *Exp.* 14 mm.

(20 a) *Argyractis cuprescens*, sp. n.

♀. Head, thorax, and abdomen cupreous red-brown mixed with some white, the abdomen banded with white; frons white at sides. Fore wing cupreous red-brown; a broad oblique silvery-white band from median nervure before middle to inner margin near base; a white medial line defined on each side by darker brown, excurved below costa, then erect; an orange-yellow discoidal bar defined on outer side by a brown line; postmedial line represented by a silvery-white bar from costa connected with an oblique wedge-shaped patch from beyond the cell to above vein 2 and an oblique band from lower angle of cell to inner margin with an orange-yellow patch between it and the wedge-shaped patch; a silvery-white band before termen ending in a point at vein 2; an orange-yellow terminal band defined at sides by brown lines, ending below submedian fold where it is bent inwards; cilia brown at base, white at tips. Hind wing silvery white; some brown at base; a brown medial band, incurved below the cell, with an orange-yellow discoidal patch on it and some orange-yellow below the cell; postmedial line cupreous brown, oblique to beyond lower angle of cell, then incurved; an irregularly reniform white subterminal patch defined by cupreous brown from costa to vein 4; a black terminal band from apex to vein 2 with five iridescent silvery annuli on it, defined on inner side by a white line with a waved black-brown line before it and with some fulvous yellow from it to tornus; cilia white, red-brown at base except towards tornus.

*Hab.* ECUADOR, Rio Verde (*Palmer*), 1 ♀ type. *Exp.* 18 mm.

(24 a) *Argyractis productalis*, sp. n.

♀. Head, thorax, and abdomen red-brown mixed with whitish, the abdomen with whitish bands on basal and 3rd segments; antennæ red-brown; frons whitish; ventral surface of abdomen white. Fore wing red-brown mixed with white, the subterminal triangular patch from costa to vein 2 deep red-brown; a rather diffused white antemedial band from below costa to inner margin; a white medial band defined on outer side by brown, sharply bent inwards to inner margin; a white discoidal bar defined by red-brown; a white postmedial band, its outer edge oblique to vein 3, then retracted to near lower angle of cell, then oblique to inner margin near tornus with its inner edge defined by brown; a silvery-white subterminal band from costa to below vein 2 where it ends in a point and is somewhat bent inwards, a fulvous-yellow band beyond it defined at sides by brown lines; cilia white, brown at base except towards tornus. Hind wing white, the terminal area irrorated with black to vein 3;

a faint rather diffused yellow-brown medial line, oblique to below the cell, then incurved; postmedial line indistinct, yellow-brown, oblique to below vein 4, then inwardly oblique and sinuous; a black point just below apex and four black spots defined on outer side by silver before termen at veins 6 to 2 with a slight waved black line before them and some brownish beyond them before the blackish terminal line.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 1 ♀ type. *Exp.* 32 mm.

(24 c) *Argyractis argyrophora*, sp. n.

♀. Head and thorax silvery white, the vertex of head and dorsum of thorax with some rufous; abdomen silvery white irrorated with brown, the anal tuft rufous; palpi rufous, the extremity of 2nd joint and the 3rd joint white; pectus, legs, and ventral surface of abdomen white, the fore legs suffused with rufous and with black band at the extremity of the tibiæ. Fore wing silvery white, the costal area suffused with rufous; a rufous antemedial line, interrupted in submedian interspace; a silvery-white discoidal bar defined at sides by rufous; postmedial line rufous, oblique to vein 4, then almost obsolete and retracted to median nervure before end of cell, then strong and incurved, a silvery-white band beyond it extending to costa; a wedge-shaped rufous patch from costa to vein 4 before a white terminal band suffused with metallic silver defined by fine blackish lines and forming a wedge-shaped mark at tornus, the area above this mark suffused with yellow; cilia white. Hind wing white; a fulvous-yellow discoidal bar defined on outer side by a metallic silvery bar; an oblique postmedial metallic silvery band, interrupted at vein 4 and ending on termen above tornus, defined on inner side by a yellow band and with the area beyond it yellow; five partly confluent black spots on termen with some metallic silvery between them from below apex to vein 2 and with some silver on termen from them to tornus; cilia white with a fine brown line near base from apex to vein 2.

*Hab.* COLOMBIA, Choko Prov., Condoto (*Spurrell*), 5 ♀ type, R. San Juan, Juntas de R. Tamana, 1 ♀. *Exp.* 20 mm.

(25 a) *Argyractis brunneosuffusa*, sp. n.

♀. Head and thorax red-brown mixed with some whitish; abdomen fulvous brown with whitish segmental lines, the base with some whitish; palpi with the 3rd joint white; ventral surface of abdomen red-brown with white segmental lines. Fore wing whitish suffused with red-brown especially on costal area; a sub-basal shade formed by black-brown scales; a curved whitish antemedial line defined by shades formed by dark brown scales in the interspaces; a slight white discoidal lunule defined by diffused dark brown; postmedial line white defined on inner side by rather diffused dark brown, oblique to vein 6, incurved at discal fold, at

vein 3 retracted to just below angle of cell and excurved below vein 2; a white subterminal band narrowing to points at apex and vein 2, defined on inner side by diffused dark brown and on outer by a yellow terminal band defined on each side by dark lines. Hind wing white, the inner area tinged with red-brown; an oblique white band beyond the cell from below costa to submedian fold, defined on each side by red-brown shades; postmedial line white, oblique to vein 2 where it is excurved to near termen, incurved at submedian fold then bent outwards to termen above tornus, defined on inner side by red-brown and with an oblique white bar before it near tornus, the area beyond it suffused with brown from costa to vein 2 with a whitish patch on it; a black band just before termen from below apex to vein 2, with four metallic silvery annuli on it; the apex yellow followed by a yellow line beyond the ocellate band; cilia white with a brown line at base to vein 2.

*Hab.* ECUADOR, R. Pastaza, Banos (*Palmer*), 1 ♀ type. *Exp.* 32 mm.

(31 b) *Argyrectis mimicalis*, sp. n.

Head and thorax whitish mixed with pale red-brown; abdomen white tinged with pale red-brown; pectus, legs, and ventral surface of abdomen white with a faint rufous tinge. Fore wing white irrorated with blackish; an inwardly oblique antemedial series of black striæ; a yellow patch in and above end of cell; medial line black, erect to just beyond lower angle of cell, then oblique, sinuous and with another faint line before it towards inner margin; an indistinct black postmedial line from vein 3 to inner margin, angled outwards above vein 1; the apical area yellow, broadly at costa and narrowing to a point at submedian fold; a subterminal white spot below costa before a blackish and silvery line from below the costa to vein 3 towards which it is rather diffused; a small black spot at apex, then a terminal series of black points to submedian fold where there is a black and silvery mark before it; cilia white mixed with fuscous. Hind wing white thickly irrorated with black except on basal and terminal areas; a diffused oblique black subbasal band from discal fold to inner margin; a waved white medial line slightly defined on each side by black; subterminal line white defined on each side by black, excurved below costa, then sinuous; terminal area yellow; a black bar with some silvery-blue scales on it at apex, then three black ocelli each with two silvery-blue points on them and a black spot with some silvery blue on it below submedian fold; cilia white with a black line near base to discal fold, then black bars beyond the ocelli.

*Hab.* SIERRA LEONE (*Clements*), 1 ♂; N. NIGERIA, Zungeru (*Macfie*), 1 ♀ type, Borgu, Yelwa L. (*Migeod*), 1 ♀. *Exp.* 14 mm.

(31 c) *Argyractis nyasalis*, sp. n

♂. Head and thorax pale yellow mixed with black-brown and some white; abdomen pale red-brown with white segmental lines and a blackish patch before extremity; antennæ dark brown ringed with white; palpi pale rufous; pectus and legs white tinged with rufous, the fore tibiæ with black band near extremity; ventral surface of abdomen white. Fore wing white irrorated with black; a blackish patch at base of costa; a diffused inwardly oblique black subbasal line; a golden-yellow antemedial patch defined by black scales from cell to inner margin; a double inwardly oblique sinuous black medial line; postmedial line double, black filled in with white, oblique to vein 3, then retracted with an upwards curve to lower angle of cell, then strongly excurved above inner margin, the area beyond it yellow irrorated with black; a white subterminal band defined by black lines from costa to vein 4 with some black below it and an oblique black mark above tornus; a terminal yellow band to vein 2; cilia white mixed with black. Hind wing white, the postmedial area to vein 2 and the terminal area irrorated with black; a small black spot on inner margin near base; a broad black antemedial band from below costa to inner margin with a small yellow spot on it in lower angle of cell, defined on outer side by a white line followed by a curved black line; a double black subterminal line filled in with white, excurved below costa, then sinuous, the area beyond it yellow; four rather diffused black ocelli with silvery-blue points on them on termen between vein 7 and the submedian fold, with a waved black line before them; cilia blackish at base, white at tips.

*Hab.* BR. C. AFRICA, Blantyre (*Davey*), 1 ♂ type. *Exp.* 16 mm.

(45 a) *Argyractis melanograpta*, sp. n.

♂. Silvery white; head with some black-brown behind; abdomen with black-brown band on 2nd segment and slight bar near extremity, the anal tuft brown at extremity; palpi with the 3rd joint black; fore femora and fore and mid tibiæ black-brown in front, the tarsi banded with black-brown. Fore wing with oblique black-brown subbasal band from costa to median nervure; medial line black-brown, double and oblique towards costa, then single, inwardly oblique, rather diffused and bent inwards to inner margin; subterminal line black-brown, double towards costa and inner margin, bent outwards to costa where the inner line has a short streak on its inner side at costa, excurved to near termen at middle and with some black-brown suffusion beyond it at tornus; a black-brown terminal line from below apex to vein 4; cilia tinged with yellow. Hind wing with some black-brown in end of cell; an obliquely curved black-brown medial line, arising below costa and diffused on outer side towards inner margin; a rather interrupted sinuous black-brown subterminal line, diffused below discal fold; cilia

yellow at base and with some black-brown scales at middle at apex, brown at base from discal fold to tornus.

*Hab.* BR. GUIANA, Demerara (*Rodway*), 1 ♂ type. *Exp.* 10 mm.

(46 a) *Argyractis phæopastalis*, sp. n.

♀. Head and tegulæ white; thorax and abdomen white suffused with brown; antennæ brown, yellowish white towards base; palpi white; pectus, legs, and ventral surface of abdomen white, the fore and mid legs tinged with yellow. Fore wing red-brown; a slight whitish medial line, angled outwards below costa and excurved below the cell; an obliquely curved white postmedial line from costa to vein 4 where it is met by an oblique white mark on its inner side from vein 6; a silvery-white subterminal band from below costa, where it is bent outwards to vein 4, an orange-yellow band beyond it on termen extending to vein 2 and defined by brown lines, some silvery white below it above tornus; cilia white. Hind wing red-brown; an indistinct sinuous whitish medial line defined on inner side by darker brown; four minute ocelli just before termen between veins 7 and 2 with black centres and metallic silvery annuli; cilia white, yellow at base and with dark brown line at middle from apex to vein 2.

*Hab.* COLOMBIA, Choko, Prov. Condoto (*Spurrell*), 1 ♀ type. *Exp.* 10 mm.

(1 c) *Eristena tenebrifera*, sp. n.

Antennæ of male thickened with scales above towards base; hind femora with fringe of short hair behind towards base, the hind tibiæ with large tuft of long hair on inner side; fore wing with veins 3, 4 stalked.

♂. Head, thorax, and abdomen white tinged with ochreous brown and mixed with some fuscous; antennæ fuscous; hind legs with the fringe of hair on femora whitish, the tuft of hair on tibiæ white at base, black at tips. Fore wing white tinged with ochreous brown; some black suffusion on basal area; medial area with some black suffusion, its inner edge rather oblique, its outer incurved below the cell and excurved above inner margin; some blackish suffusion on postmedial costal area and two rather diffused blackish subterminal lines, somewhat excurved below costa, then oblique; a slight dark terminal line with some ochreous brown before it. Hind wing white, the terminal area suffused with ochreous brown.

*Hab.* DUTCH N. GUINEA, Mimika R. (*Wollaston*), 1 ♂ type. *Exp.* 14 mm.

(1 f) *Eristena tetralitha*, sp. n.

♀. Head, thorax, and abdomen grey suffused with brown and some fuscous; pectus and ventral surface of abdomen whitish; fore tibiæ with black stripe. Fore wing whitish suffused with



brown and irrorated with black; an oblique diffused black ante-medial shade; the cell whiter towards extremity; postmedial line rather diffused, black, obliquely curved to vein 3, then bent upwards to upper angle of cell, then inwards and oblique to inner margin, the area above its sinus whitish except towards costa and the area in its sinus at end of cell and the whole area beyond it rufous; an obliquely curved rather maculate silvery subterminal line defined on each side by fuscous; a terminal series of black points; cilia white mixed with brown. Hind wing whitish; the basal area tinged with brown and suffused with black; a rather diffused curved black postmedial line, incurved below vein 3; the terminal area suffused with rufous; four small black ocelli before termen between discal and submedian folds, the two or three upper ocelli with white points in centre, and the upper one with a black point above it; cilia whitish tinged with brown and with a brown line near base.

*Hab.* DUTCH N. GUINEA, Mimika R. (*Wollaston*), 5 ♀ type, Wataikwa R. (*Wollaston*), 4 ♀, Snow Mts., Setakwa R. (*Meek*), 1 ♀; BR. N. GUINEA, Kumusi R. (*Meek*), 3 ♀. *Exp.* 14-20 mm.

(16 a) *Nymphula manilensis*, sp. n.

♂. Head, thorax, and abdomen yellow mixed with some white and fuscous, the last white at base and extremity and with black segmental lines; antennæ yellow ringed with black; pectus, legs, and ventral surface of abdomen white slightly irrorated with brown. Fore wing yellow irrorated with dark brown and mixed with some white, especially on outer half of medial area except towards costa; antemedial line white defined by some black scales, oblique below the cell; a black point in middle of cell and some black suffusion in end of cell; medial line white defined on inner side by black scales, oblique to middle of discocellulars, then inwardly oblique, an oblique white mark beyond it below costa; postmedial line double, brown filled in with white, arising below the costa where there is a white mark before it, oblique and sinuous; subterminal line formed by somewhat dentate white marks defined on each side by blackish, excurved at middle. Hind wing yellow irrorated with black, the base white; an oblique black mark above inner margin near base; medial line double, black filled in with white, sinuous; medial area white with a yellow patch defined by black from below costa to vein 2; postmedial line double, black filled in with white, obliquely curved, slightly sinuous towards costa; a rather maculate white subterminal band defined on each side by black, sinuous; a fine black terminal line; cilia white.

*Hab.* PHILIPPINES, Manila (*Ledyard*), 1 ♂ type. *Exp.* 14 mm.

(19 a) *Nymphula leucoplagalalis*, sp. n.

*Bocchoris zoilusalis*, Druce, Biol. Centr.-Am., Het. ii. p. 558 (part.), nec Wlk.

♂. Head, thorax, and abdomen fulvous yellow mixed with fuscous

and some white; antennæ black; pectus, hind legs, and ventral surface of abdomen towards base white; fore tibiæ fuscous, white at extremities. Fore wing fulvous yellow irrorated with dark red-brown; a subbasal red-brown shade; a medial red-brown shade with some white scales on it in end of cell, a white patch beyond it on costal area, defined on outer side by a red-brown shade joining the medial shade at lower angle of cell, then with three small white spots on its outer edge, a small white spot beyond it on costa; the terminal area suffused with dark red-brown. Hind wing fulvous yellow, the basal half and terminal area suffused with dark red-brown.

*Hab.* MEXICO, Morelos, Cuernavaca (*H. H. Smith*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 14 mm.

(30 b) *Nymphula plumbefusalis*, sp. n.

♀. Head and thorax leaden grey tinged with fuscous; abdomen white, basally suffused with reddish brown; antennæ dark brown; frons white; palpi with the 3rd joint white; pectus, legs, and ventral surface of abdomen white, the fore and mid legs tinged with brown, the fore tibiæ blackish on inner side, white on outer side except towards base. Fore wing leaden grey tinged with brown; an antemedial black spot below the cell and slight rufous and dark shade towards inner margin; a black discoidal spot; an indistinct diffused rufous postmedial shade, incurved below vein 4 to below end of cell, arising below the costa and interrupted below the cell; a faint dark subterminal shade; a faint punctiform brown line before termen and terminal series of slight dark spots. Hind wing pure white; a faint reddish-brown line from lower angle of cell to vein 1; a reddish-brown postmedial bar at discal fold, diffused spot at vein 2 and small spot at inner margin; a punctiform line before termen and a terminal line; cilia white mixed with reddish brown and chequered with darker brown at base.

*Hab.* SUDAN, Blue Nile (*Flower*), 6 ♀ type. *Exp.* 20 mm.

(52 b) *Nymphula metastictalis*, sp. n.

♀. Head, thorax, and abdomen white, the metathorax with brownish bar, the abdomen tinged with ochreous brown except at base; fore tibiæ fuscous brown at extremities. Fore wing silvery white slightly tinged with ochreous brown except on terminal area; small black-brown spots at base of costa and cell; a black-brown antemedial spot on costa; an inwardly oblique brown medial line with black spot at costa; a small white discoidal spot indistinctly defined by brown; postmedial line brown with a black spot at costa where it arises towards apex, excurved to vein 2, then incurved to inner margin below end of cell; a curved brown subterminal line from vein 7 to submedian fold; a fine black terminal line before a yellow terminal band, punctiform towards apex; cilia white suffused with brown. Hind wing white suffused with reddish brown except

at base and on inner area; diffused brown ante- and postmedial lines and a faint subterminal shade; two small black spots just before termen below apex and eight between discal and submedian folds, all defined on inner side by white; the termen yellow; cilia brown at base, white at tips.

*Hab.* Goodenough I. (*Meek*), 1 ♀ type. *Exp.* 20 mm.

(53 b) *Nymphula flavicostalis*, sp. n.

Fore wing of male without fovea below the cell.

♂. Head and thorax white mixed with black-brown and some yellowish; abdomen white irrorated with black forming diffused dorsal bands except at base; antennæ yellow ringed with brown; palpi yellow mixed with red-brown; pectus and ventral surface of abdomen white irrorated with dark brown; legs white, the tibiæ and tarsi banded with black. Fore wing white tinged in parts with brown and irrorated with black-brown, the costal area to end of cell and towards apex orange-yellow; antemedial line white defined on each side by blackish, curved, obsolete at inner margin; an elongate white spot in the cell before the medial line which is white defined on each side by blackish, slightly waved, oblique below the cell, a white patch beyond it on costal area; an irregular yellowish discoidal spot defined by black scales; postmedial line white defined on each side by dark brown, immaculate and slightly curved to vein 3, then bent inwards and obsolescent to lower angle of cell, then erect and sinuous, some alternating black and white marks before it on costa; a white subapical point, then a series of white subterminal lunules, larger and extending to near the postmedial line above and below vein 6, with diffused black marks beyond them to vein 3; the termen narrowly yellow; cilia black at base, then white with black marks towards apex and at middle. Hind wing white; rather diffused brownish medial and postmedial lines; the termen suffused with brownish, its inner edge slightly waved; some slight dark marks on termen towards apex; cilia with some dark scales at tips; yellowish at base and with a blackish line at middle between veins 3 and 1.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 1 ♂ type. *Exp.* 22 mm.

(53 c) *Nymphula graphicalis*, sp. n.

♀. Head, thorax, and abdomen white, the last with faint dorsal ochreous-brown bands except at base. Fore wing silvery white; a subbasal black point below vein 1; a slight antemedial spot formed by black scales below costa; medial line with an oblique black striga from costa, then double and pale ochreous brown, incurved in the cell and obliquely excurved below it; a narrow discoidal lunule defined by black and a patch of pale ochreous-brown suffusion below end of cell; postmedial line double, brown with a black point on the inner line at costa, excurved below costa, then oblique,

slightly waved and paler below vein 4, a pale ochreous-brown tinge before its costal half and beyond it below vein 5, pale ochreous-brown streaks beyond it on costa and vein 7 with a black streak between them from termen; cilia tinged with ochreous brown. Hind wing silvery white; a double waved black-brown antemedial line; a discoidal bar defined by black-brown; postmedial line double, ochreous brown and somewhat dentate, slight ochreous-brown suffusion before it except towards costa and inner margin and slight streaks beyond it on the veins of costal half, then brown suffusion to tornus; cilia with pale ochreous brown mixed.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 1 ♀ type. *Exp.* 20 mm.

(1b) *Margarosticha gaudialis*, sp. n.

♂. Head and thorax greyish mixed with brown, the tegulae and patagia with some fulvous; abdomen fulvous with brown dorsal bands; antennae whitish tinged with brown; palpi banded with dark brown; pectus, legs, and ventral surface of abdomen whitish tinged with brown, the fore legs with the femora black above, the tibiae black at extremities, the tarsi with black marks at the joints. Fore wing fulvous orange, the base tinged with brown; an oblique silvery band defined on each side by brown from middle of cell to inner margin; the fovea in end of cell surrounded by brown suffusion; a triangular silvery-white mark beyond the cell defined by rather diffused brown which extends to the costa; a silvery-white subterminal band from costa to vein 4 where it ends in a point, defined on inner side by rather diffused brown and on outer by a black line extending to below vein 3; a terminal series of small black spots to vein 2 and a short leaden-brown fascia above tornus ending in a silvery point; cilia silvery. Hind wing fulvous orange, the base pale; a slightly sinuous silvery-white medial band defined on each side by brown; the postmedial area brown, ending in a point above tornus; four ocellate black spots on termen between vein 7 and submedian fold, defined on inner side by a waved white line and with fulvous orange between them, a small triangular black spot above the uppermost ocellus; cilia silvery.

*Hab.* ADMIRALTY IS. (*Meek*), 3 ♂ type. *Exp.* 18 mm.

(3a) *Margarosticha euprepialis*, sp. n.

♂. Head and thorax silvery white, the shoulders and some hairs at tips of patagia yellow-brown; abdomen silvery white at base with a yellow-brown band, then pale yellow with slight yellow-brown dorsal spots to beyond middle and silvery-white segmental lines; antennae pale fulvous; palpi white, the 2nd joint banded with pale red-brown; pectus, legs, and ventral surface of abdomen silvery white, the fore tibiae tinged with yellow above. Fore wing pale yellow; a red-brown tinge at base of costa and a triangular white patch on basal inner area defined on outer side by red-brown scales;

a broad oblique silvery-white medial band from cell to inner margin, defined on inner side by a curved red-brown line and on outer by a diffused red-brown patch from submedian fold to inner margin; an oblique silvery-white discoidal bar beyond the fovea; an oblique conical silvery-white postmedial patch from costa to vein 3, defined by red-brown and with some red-brown beyond it on costa; a silvery-white subterminal band from costa to discal fold, defined by red-brown extending to vein 2 where it ends in a point and with a wedge-shaped brown mark below it above tornus, these brown markings tinged with silvery below the band; a fine red-brown terminal line; cilia silvery. Hind wing white; a black-brown subbasal band from below costa to above outer margin; a yellow band from middle of costa to tornus defined on each side by slightly sinuous red-brown lines, the outer line with a brilliant silver line beyond it; the area beyond the band irrorated with black scales; five black ocellate spots on a white band on termen between discal and submedian folds with small brilliant silvery spots between them; the termen yellow towards tornus; cilia silvery.

*Hab.* QUEENSLAND, Townsville (*Dodd*), 1 ♂ type. *Exp.* 22 mm.

(5) *Margarosticha argyrograpta*, sp. n.

♀. Head, thorax, and abdomen orange-yellow with a golden gloss, the head, patagia, and base of abdomen with some white; palpi white with brown band at extremity of the 2nd joint and the 3rd joint yellow; pectus, legs, and ventral surface of abdomen white, the fore and mid tibiæ tinged with yellow and the former black at extremity. Fore wing orange-yellow; a silvery-white subbasal patch from middle of cell to inner margin where it extends to the base, its outer edge angled outwards at median nervure; an oblique silvery-white medial band from discal fold to inner margin, produced to streaks beyond lower angle of cell and below cell 2; an oblique triangular silvery-white postmedial patch from costa to vein 4, its outer edge defined by brown; a wedge-shaped silvery-white subterminal band from costa to below vein 3, slightly defined at sides by brown and its lower part metallic silvery; a metallic silvery fascia above tornus; a terminal series of black points with larger point at apex; cilia white tinged with yellow. Hind wing orange-yellow, the base white; a silvery-white medial band with slightly waved edges, its inner edge defined by brown; a metallic silvery postmedial lunule between veins 5 and 2 and a spot above tornus; three large black ocellate spots on termen between discal and submedian folds with some silvery scales on their inner edge and a line before them which is yellowish above and silvery white below, extending to termen below the lowest spot, a small triangular black spot above the uppermost spot on termen; cilia silvery white at base, white tinged with brown at tips.

*Hab.* BISMARCK ARCHIPELAGO, Rook I. (*Meek*), 3 ♀ type. *Exp.* 18-22 mm.

(1c) *Cataclysta perirrorata*, sp. n.

Head, thorax, and abdomen silvery white mixed with brown; antennæ white tinged with brown; palpi white tinged with yellow; pectus, legs, and ventral surface of abdomen white tinged with brown. Fore wing white, the medial area irrorated with large black scales; the base orange-yellow with some brown at costa; an inwardly oblique orange-yellow antemedial band slightly defined at sides by brown; an oblique orange-yellow postmedial band from below costa to termen at submedian fold where it is confluent with a similar curved subterminal band, a silvery point below its extremity with a yellow striga before it to tornus; an orange-yellow terminal band from just below apex to vein 3 where it ends in a point, defined on inner side by a brown line and with some silver between it and the subterminal band except towards costa; cilia white mixed with brown. Hind wing white, the medial area irrorated with large black scales, narrowing to inner margin near tornus; a faint oblique orange-yellow antemedial shade; two fine very slightly waved black subterminal lines, slightly excurved below costa and bent outwards to tornus; four ocellate black spots on termen from below apex to submedian fold with small metallic silver spots on the 1st and 4th and small silver spots between them on termen; cilia white with a brown line at base and some brown at tips especially towards apex.

Ab. 1. Abdomen orange-yellow mixed with brown; fore wing with the costal area suffused with brown, the medial area more thickly irrorated with black except towards costa, the medial band on outer side and the subterminal band on inner side with some silvery suffusion, the oblique postmedial band almost interrupted at middle and with distinct bar from it to tornus; hind wing suffused with brown except at base, the oblique orange-yellow antemedial band distinct, defined by brown and bent inwards to inner margin, the ocellate terminal black spots more confluent. Br. C. Africa, Mashonaland.

Ab. 2. Fore wing with the bands and hind wing with the antemedial shade rufous. Cape Colony.

*Hab.* GOLD COAST, Appan, 1 ♂, Bibianaha (*Spurrell*), 4 ♂, 2 ♀, Kumasi (*Sanders*), 1 ♂ type; S. NIGERIA, Ebute Meta (*Boag*), 1 ♂, 1 ♀; BR. C. AFRICA, Zomba (*Old*), 1 ♀, Mt. Mlanje (*Neave*), 4 ♂, 2 ♀; MASHONALAND (*Dobbie*), 2 ♂; CAPE COLONY, Annshaw (*Miss F. Barrett*), 1 ♂. *Exp.* 12-16 mm.

(1e) *Cataclysta nigristriata*, sp. n.

Head, thorax, and abdomen silvery white suffused with red-brown, the last more fulvous towards extremity; palpi brown towards base, white towards extremity; pectus, legs, and ventral surface of abdomen white tinged with brown. Fore wing white, the medial area except towards costa irrorated with large black scales and with fine black streaks beyond the cell and on vein 1

and inner margin, the terminal area from costa beyond middle to inner margin near tornus golden yellow; the base reddish brown with inwardly oblique outer edge; a faint inwardly oblique yellowish antemedial band, followed by a cupreous-brown medial line, incurved below the cell; an oblique wedge-shaped white post-medial patch from costa to discal fold, defined on inner side by brown; a subterminal band from below costa to vein 4 where it ends in a point, white above, silvery below, defined by black lines, the line on inner side reaching the costa; an oblique silvery bar from below vein 4 beyond the cell to just above tornus; cilia white tinged with cupreous brown except at submedian fold and at tips between veins 6 and 4. Hind wing white, the medial area irrorated with large black scales and with slight streaks below costa and triangular in shape, from costa to submedian fold; cupreous-brown bars at and beyond end of cell; the inner area orange-yellow from before middle to tornus with metallic streaks on it at middle of inner margin and in terminal part of submedian fold; an oblique black line from below apex to submedian fold beyond middle; five ocellate black spots on termen from below apex to above tornus with a white band before them and orange-yellow between their upper parts and metallic silver spots on termen, the first and third black spots smaller; cilia cupreous brown, white at tips except at apex.

*Hab.* DUTCH N. GUINEA, Ron I. (*Doherty*), 1 ♂, 1 ♀, Kapaur (*Doherty*), 1 ♂, Mimika (*Woolaston*), 1 ♂ type; ADMIRALTY IS. (*Meak*), 1 ♂, 1 ♀; LOUISIADE IS., St. Aignan (*Meek*), 1 ♀. *Exp.* 12 mm.

(1g) *Cataclysta amboinalis*, sp. n.

♀. Head, thorax, and abdomen golden yellow mixed with white and black; antennæ brownish, yellow towards base; palpi yellow tinged with brown; pectus, legs, and ventral surface of abdomen white tinged with brown. Fore wing white, the basal area and costal area to end of cell tinged with cupreous brown, the medial area irrorated with large black scales except towards costa, the apical area from costa at end of cell to termen above tornus golden yellow defined on inner side by brown; antemedial line dark brown, slightly curved; an oblique wedge-shaped silvery-white postmedial patch defined by brown from costa to vein 4; a curved subterminal band from costa to vein 3, silvery white above, metallic silvery below defined by black lines, the outer line not reaching the costa; an oblique metallic silvery spot defined by blackish above tornus; cilia cupreous brown at base, white tinged with brown at tips, at submedian fold pure white to base. Hind wing white, the medial area irrorated with large black scales except towards inner margin, the terminal area cupreous brown; a slight black spot near base below the cell; an indistinctly double oblique cupreous-brown antemedial line; four partly confluent ocellate black spots with metallic silver centres on termen from below apex to submedian

fold, with some orange-yellow scales before the three lower spots and metallic gold points between the spots on termen; cilia cupreous brown at base, white tinged with brown at tips.

*Hab.* AMBOINA (*Doherty*), 1 ♀ type. *Exp.* 12 mm.

(1 h) *Cataclysta queenslandica*, sp. n.

♂. Head and thorax silvery white, the patagia yellowish at tips; abdomen silvery white suffused with golden yellow; antennæ brownish with white points in front; palpi yellow tinged with brown; pectus, legs, and ventral surface of abdomen white tinged with yellow, the fore femora above and tibiæ on inner side black. Fore wing white, the basal area obliquely and the costal area to end of cell cupreous brown, the medial area irrorated with cupreous brown except towards costa, the terminal area orange-yellow from costa at end of cell to inner margin near tornus; a cupreous-brown discoidal spot and two lines from lower angle of cell, diverging towards inner margin; an oblique wedge-shaped silvery-white post-medial patch from costa to vein 4, some cupreous brown beyond it on costa; a subterminal band from below costa to vein 3, where it ends in a point, white above and metallic silver below, the white part defined at sides by cupreous brown on inner side extending to the costa; an oblique metallic silver spot above tornus; a fine dark terminal line; cilia cupreous brown, white at submedian fold. Hind wing white, the postmedial area irrorated with large black scales, triangularly from costa where it extends to apex to submedian fold; the base tinged with yellow; a cupreous-brown ante-medial bar in and below the cell; an oblique cupreous-brown medial band from costa to submedian fold; the terminal half of inner area orange-yellow with some metallic silver at middle of inner margin; a fine sinuous black-brown subterminal line from apex to above tornus; five partly confluent ocellate black spots on termen with metallic silver points between them and orange-yellow points on termen; cilia cupreous brown at base, white tinged with brown at tips.

♀. Head with dark bar behind antennæ; thorax tinged with ochreous brown; abdomen yellower; fore wing with the base and costal area redder brown, an oblique red-brown medial band, the yellow terminal area defined on inner side by two red-brown lines, angled inwards to lower angle of cell; hind wing with oblique orange-yellow medial band defined at sides by cupreous-brown lines, the postmedial area more strongly irrorated, the subterminal line more distinct and defined on each side by yellowish white, the terminal ocellate spots better defined and separate.

*Hab.* QUEENSLAND, Cooktown, Cedar Bay (*Meek*), 1 ♂ type, Kuranda (*Dodd*), 1 ♀. *Exp.*, ♂ 14, ♀ 16 mm.

[To be continued.]



XXXIV.—A Revision of the Clupeid Fishes of the Genera *Sardinella*, *Harengula*, &c. By C. TATE REGAN, M.A.

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THE genus *Clupea*, as understood by Günther, includes a number of genera which may be arranged in two groups: one of these, characterized by a well-marked median notch in the upper jaw, has been dealt with in a recent paper (*supra*, p. 297); the other group includes genera without a distinct notch in the upper jaw, namely, *Clupea*, *Clupeonella*, *Sardina*, *Sardinella*, *Opisthonema*, *Harengula*, *Lile*, and *Heringia*. Of these I have already published revisions of *Clupea* and *Sardina* ('Annals,' (8) xviii. 1916, p. 1, and xix. 1917, p. 226), and I have nothing to add to Berg's synopsis of *Clupeonella* (*Harengula*, Berg, 'Annals,' (8) xi. 1913, p. 480, and Poiss. de l'eau douce de la Russie, p. 30, 1916). The other genera, comprising species that are mostly tropical and strictly marine, form the subject of the present paper.

## SARDINELLA, Val. 1847.

Cuv. &amp; Val. Hist. Nat. Poiss. xx. p. 263.

*Clupeonia*, Cuv. & Val. t. c. p. 345.

This genus is closely related to *Sardina*, Antipa (Regan, Ann. & Mag. Nat. Hist. (8) xviii. 1916, p. 11), from which it differs especially in the absence of radiating grooves on the operculum and in the structure of the posterior margin of the branchial chamber, the vertical edge of the cleithrum being covered by a dermal fold which bears two obtusely pointed projections some distance apart, with a shallow concavity between them. The vertebræ are fewer than in *Sardina*, numbering 44 in *S. gibbosa*, 45 in *S. sindensis*, and 46 in *S. longiceps* and *S. maderensis*.

The majority of the species are tropical, but those of the Eastern Atlantic range into the Mediterranean; most of them are of considerable economic value, both as food-fishes and as a source of oil.

*Synopsis of the Species.*

I. Ventral scutes sharply keeled.

A. Pelvic fins 9-rayed; a dark spot at edge of operculum.

Eye  $3\frac{1}{2}$  to  $4\frac{1}{2}$  in length of head, which is  $3\frac{1}{2}$  to 4 in length of fish; 110-160 gill-rakers on lower part of anterior arch

1. *aurita*,

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- Eye 5 to 6 in length of head, which is 3 to  $3\frac{1}{2}$  in length of fish; 180-250 gill-rakers on lower part of anterior arch. .... 2. *longiceps*.
- B. Pelvic fins 8-rayed; a dark spot at base of anterior rays of dorsal fin.
1. Mediterranean and West African species.
- Depth  $3\frac{1}{2}$  to 4 in length; 60 to 95 gill-rakers on lower part of anterior arch (in specimens of 100 to 300 mm.) .... 3. *maderensis*.
- Depth  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in length; 110 to 130 gill-rakers on lower part of anterior arch (in specimens of 100 to 200 mm.) .... 4. *leba*.
- Depth 3 in length; 90 to 100 gill-rakers on lower part of anterior arch (in specimens of 170 to 200 mm.) .... 5. *cameronensis*.
2. Indo-Pacific species.
- Depth  $2\frac{3}{4}$  in length; 130 gill-rakers on lower part of anterior arch .... 6. *dayi*.
- Depth  $2\frac{1}{2}$  to 3; gill-rakers 55 to 65; diameter of eye 3 to  $3\frac{1}{2}$  in length of head. .... 7. *brachysoma*.
- Depth 3; gill-rakers 48 to 55; diameter of eye  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in length of head. .... 8. *perforata*.
- Depth 3 to  $3\frac{1}{2}$ ; gill-rakers 70 to 75 .... 9. *fimbriata*.
- Depth  $3\frac{1}{4}$  to 4; gill-rakers 58 to 62 .... 10. *sindensis*.
- Depth  $3\frac{1}{2}$  to 4; gill-rakers 50 to 55 .... 11. *gibbosa*.
- Depth  $3\frac{1}{2}$  to 4; gill-rakers 38 to 44 .... 12. *melanura*.

## II. Ventral scutes feebly keeled.

- Maxillary nearly or quite reaching to below eye; 36 to 40 gill-rakers on lower part of anterior arch; pelvics below anterior half of dorsal .... 13. *sirm*.
- Maxillary not reaching eye; 27 to 31 gill-rakers on lower part of anterior arch; pelvics below origin of dorsal. .... 14. *clupeoides*.

## 1. *Sardinella aurita*.

? *Clupea caeruleo-vittata*, Richards, Ichth. China, p. 305 (1846) \*.

*Sardinella aurita*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 263, pl. 594 (1847).

*Sardinella anchovia*, Cuv. & Val. t. c. p. 269.

*Meletta mediterranea*, Cuv. & Val. t. c. p. 369.

— *Sardinella lemuru*, Bleek. Nat. Tijdschr. Ned. Ind. v. 1853, p. 500.

? *Sardinia pseudohispanica*, Poey, Mem. Cuba, ii. p. 311 (1860).

*Clupea aurita*, Günth. Cat. Fish. vii. p. 420 (1868).

*Clupea anchovia*, Günth. t. c. p. 421.

*Clupea melanosticta*, Günth. t. c. p. 430.

*Clupea lemuru*, Günth. t. c. p. 430; Bleek. Atl. Ichth. vi. p. 108, Clup. pl. ix. fig. 1 (1872).

? *Clupea pseudohispanica*, Günth. t. c. p. 442.

*Clupea brasiliensis*, Steind. Sitzungsab. Akad. Wien, lxxx. 1880, p. 182.

\* Richardson's description is based on a coloured figure by Reeves, probably, but not certainly, intended to represent this species.

*Clupanodon pseudohispanicus*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 423.

*Sardinella anchovia*, Jord. & Everm. t. c. p. 429.

*Clupea immaculata*, Kishinouye, Journ. Imp. Fisheries Bureau Tokyo, xiv. 1907, p. 96, pl. xix. fig. 1.

*Sardinella eurina*, Antipa, Denkschr. Akad. Wien, lxxviii. 1906, p. 46 pl. iii. fig. 12.

*Clupea longiceps*, Weber & Beaufort, Fish. Indo-Austral. Archipelago, ii. p. 82 (1913).

Depth of body 4 to  $5\frac{1}{4}$  in the length, length of head  $3\frac{1}{2}$  to 4. Snout as long as or longer than diameter of eye, which is  $3\frac{1}{2}$  to  $4\frac{1}{2}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye; a patch of teeth on the tongue. 110 (young) to 160 gill-rakers on lower part of anterior arch. About 48 scales in a longitudinal series, 12 to 14 in a transverse series; ventral scutes sharply keeled, 18-20 + 13-15. Dorsal 16-20. Anal 15-19. Pelvics 9-rayed, inserted below or behind middle of dorsal. A dark spot at edge of operculum. Vertebrae 47 or 48.

Cape Cod to Rio Janeiro; Black Sea and Mediterranean; Indo-Australian Archipelago, China, and Southern Japan.

The description is based on eight specimens, 120 to 180 mm. long, from Havana, Trinidad, and Rio de Janeiro (*S. anchovia*), several of 110 to 130 mm. from Algiers, the type of *S. lemuru* from Java (145 mm. long) and two examples from China, 180 mm. long (*C. melanosticta*, Günth.). In a very small fish (75 mm.) I count 80 gill-rakers on the lower part of the anterior arch.

The discontinuous distribution of this species is remarkable; in the Indian Ocean it is represented by the allied *S. longiceps*.

## 2. *Sardinella longiceps*.

*Sardinella longiceps*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 273 (1847).

*Sardinella neohowii*, Cuv. & Val. t. c. p. 274.

*Alosa scombrina*, Cuv. & Val. t. c. p. 442.

*Clupea longiceps*, Günth. Cat. Fish. vii. p. 428 (1868); Day, Fish. India, p. 637.

*Clupea scombrina*, Günth. t. c. p. 448.

Depth of body 4 to  $4\frac{2}{3}$  in the length, length of head 3 to  $3\frac{2}{3}$ . Snout longer than diameter of eye, which is 5 to 6 in the length of head; maxillary extending to below anterior part or nearly to middle of eye. 180 to 250 gill-rakers on lower part of anterior arch. 46 to 48 scales in a longitudinal series, 12 or 13 in a transverse series; ventral scutes sharply keeled, 18-21 + 13-15. Dorsal 16-18. Anal 14-16. Pelvics 9-rayed, below or behind middle of dorsal. A dark spot at edge of operculum. Vertebrae 47.

Indian Ocean.

Several specimens, 120 to 180 mm. in total length, from Mombasa, Muscat, and India.

### 3. *Sardinella maderensis*.

*Clupea maderensis*, Lowe, Trans. Zool. Soc. ii. 1839, p. 189.

? *Sardinella granigera*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 267 (1847).

*Clupea maderensis* (part.), Günth. Cat. Fish. vii. p. 440 (1868).

Depth of body  $3\frac{2}{3}$  to 4 in the length, length of head  $3\frac{2}{3}$  to  $4\frac{1}{4}$ . Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye. 60 to 95 gill-rakers on lower part of anterior arch. 48 to 50 scales in a longitudinal, 12 or 13 in a transverse series; ventral scutes 19-20 + 14-16. Dorsal 18-19. Anal 18-19. Pelvics 8-rayed, a little in advance of middle of dorsal. A dark spot at base of anterior dorsal rays. Vertebrae 48.

Eleven specimens, 110 to 300 mm. in total length, from Madeira, Cape Verde Is., and Mogadore.

If *S. granigera* be this species, it occurs in the Mediterranean.

### 4. *Sardinella eba*.

*Alosa eba*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 369 (1847).

*Clupea maderensis* (part.), Günth. Cat. Fish. vii. p. 440 (1868).

Depth of body  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in the length, length of head  $3\frac{2}{3}$  to 4. Snout as long as diameter of eye, which is  $3\frac{1}{3}$  to 4 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or a little beyond. 110 to 130 gill-rakers on lower part of anterior arch. 44 to 46 scales in a longitudinal, 11 to 13 in a transverse series; ventral scutes 18-19 + 14. Dorsal 18-20. Anal 17-22. Pelvics 8-rayed, below middle of dorsal. A dark spot at base of anterior dorsal rays. Vertebrae 46.

Mediterranean; West Africa.

Eight specimens, 110 to 200 mm. in total length, from Egypt, Algiers, and Nigeria.

### 5. *Sardinella cameronensis*, sp. n.

*Clupea senegalensis* (non Benn.), Günth. Cat. Fish. vii. p. 441 (1868)\*.

Depth of body 3 in the length, length of head 4. Snout

\* *Alosa senegalensis*, Bennett (Proc. Zool. Soc. i. 1831, p. 147), is probably a synonym of *Sardina pilchardus*.

as long as diameter of eye, which is  $3\frac{2}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 90 to 100 gill-rakers on lower part of anterior arch. 44 scales in a longitudinal, 13 in a transverse series; ventral scutes 18-19+14. Dorsal 18-19. Anal 20-21. Pelvics 8-rayed, below middle of dorsal. Caudal lobes long,  $\frac{1}{3}$  length of fish. A dark spot at base of anterior dorsal rays. Vertebrae 46.

Two specimens, 170 and 200 mm. in total length, from Camaroon.

#### 6. *Sardinella dayi*, sp. n.

Depth of body  $2\frac{3}{4}$  in the length, length of head  $3\frac{1}{4}$ . Snout as long as diameter of eye, which is  $3\frac{2}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 130 gill-rakers on lower part of anterior arch. 44 scales in a longitudinal and 12 in a transverse series; ventral scutes 19+13. Dorsal 18, nearly equidistant from end of snout and base of caudal. Anal 19. Pelvics 8-rayed, below middle of dorsal. Pectoral  $\frac{3}{4}$  length of head. Silvery; back darker; a blackish spot at base of anterior dorsal rays; upper part of dorsal and edge of caudal dusky.

A single specimen, 125 mm. long, from Karwar, India, presented by N. B. Kinnear, Esq. The species is named in memory of Dr. Francis Day.

#### 7. *Sardinella brachysoma*.

? *Kowala albella*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 362, pl. 602 (1847).

*Sardinella brachysoma*, Bleek. Verh. Bat. Gen. xxiv. 1852, Haringacht. p. 19.

*Harengula hypselosoma*, Bleek. Nat. Tijdschr. Ned. Ind. viii. 1855, p. 427.

*Clupea brachysoma*, Günth. Cat. Fish. vii. p. 423 (1868); Bleek. Atl. Ichth. vi. p. 104, Clup. pl. ix. fig. 4 (1872); Day, Fish. India, p. 635, pl. clxiii. fig. 3 (1878); Weber & Beaufort, Fish. Indo-Austral. Archipel. ii. p. 70, fig. 25 (1913).

*Clupea hypselosoma*, Günth. t. c. p. 431; Bleek. l. c. pl. ix. fig. 2.

Depth of body  $2\frac{1}{2}$  to 3 in the length, length of head 4 to  $4\frac{1}{2}$ . Snout shorter than diameter of eye, which is 3 to  $3\frac{1}{2}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or a little beyond. 55 to 65 gill-rakers on lower part of anterior arch. 40 to 44 scales in a longitudinal and 12 or 13 in a transverse series; ventral scutes 17-20+12-13. Dorsal 17-20. Anal 18-22. Pelvics 8-rayed, below or in advance of middle of dorsal. A dark spot at base of dorsal; upper part of dorsal and ends of caudal lobes often dusky.

India; Malay Archipelago.

Seven examples, 100 to 150 mm. in length, from Madras, Java, and Amboina, including the types of the species and of *H. hypselosoma*.

### 8. *Sardinella perforata*.

*Clupeonia perforata*, Cantor, J. As. Soc. Bengal, xviii. 1850, p. 1276.  
*Chupalosa bulan*, Bleek, Verh. Bat. Gen. xxii. 1849, Madura, p. 12.  
*Spratella kowala*, Bleek, Nat. Tijdschr. Ned. Ind. ii. 1851, p. 492.  
*Clupea perforata*, Günth. Cat. Fish. vii. p. 424 (1868); Bleek, Atl. Ichth. vi. p. 110, Clup. pl. x. fig. 2 (1872); Weber & Beaufort, Indo-Austral. Arch. Fish. ii. p. 74 (1913).  
*Clupea bulan*, Bleek, Atl. Ichth. vi. p. 110, Clup. pl. viii. fig. 5 (1872).

Depth of body about 3 in the length, length of head 4 to  $4\frac{2}{5}$ . Snout as long as or a little shorter than diameter of eye, which is  $3\frac{1}{2}$  to  $3\frac{2}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 48 to 55 (58) gill-rakers on lower part of anterior arch. About 44 scales in a longitudinal, 12 or 13 in a transverse series; ventral scutes 17-20 + 10-13. Dorsal 17-20. Anal 17-20. Pelvics 8-rayed, below or in advance of middle of dorsal. A dark spot at base of anterior dorsal rays.

Indian Ocean and Archipelago.

Several specimens, 90 to 130 mm. in total length, including types of the species, of *S. kowala*, and *C. bulan*, from the Persian Gulf and the Malay Archipelago.

### 9. *Sardinella fimbriata*.

*Spratella fimbriata*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 359, pl. 600 (1847).  
*Korvala lauta*, Cantor, J. As. Soc. Bengal, xviii. 1850, p. 1279.  
*Clupea fimbriata*, Günth. Cat. Fish. vii. p. 427 (1868).

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head 4. Snout as long as diameter of eye, which is  $3\frac{1}{2}$  to  $3\frac{2}{3}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or a little beyond. 70 to 75 gill-rakers on lower part of anterior arch. About 45 scales in a longitudinal and 12 in a transverse series; ventral scutes 18-19 + 12-13. Dorsal 18-19. Anal 18-21. Pelvics 8-rayed, in advance of middle of dorsal. A dark spot at base of anterior dorsal rays; upper part of dorsal and posterior edge of caudal dusky.

Sea of Bengal.

Four specimens, 110 to 125 mm. long, from Akyab, Orissa, Malabar, and Madras (*Day*), and the types of *K. lauta* (skins) from Pinang.

10. *Sardinella sindensis*.

*Clupea sindensis*, Day, Fish. India, p. 633, pl. clxiii. fig. 2 (1878).

Depth of body  $3\frac{1}{4}$  to 4 in the length, length of head  $3\frac{2}{3}$  to  $4\frac{1}{3}$ . Snout as long as or shorter than diameter of eye, which is  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 58 to 66 gill-rakers on lower part of anterior arch. 44 to 48 scales in a longitudinal, 11 to 13 in a transverse series; ventral scutes 17-19 + 12-15. Dorsal 17-19. Anal 18-21. Pelvics 8-rayed, below or in advance of middle of dorsal. A dark spot at base of anterior dorsal rays; upper part of dorsal and ends of caudal lobes sometimes blackish.

Indian Ocean and Archipelago.

Thirteen specimens, 95 to 130 mm. in total length, from Sind, Bombay, Amboina, and Formosa.

11. *Sardinella gibbosa*.

? *Clupanodon jussieui*, Lacep. Hist. Nat. Poiss. v. pp. 469, 474, pl. xi. fig. 2 (1803).

? *Clupeonia jussieui*, Cuv. & Val. Hist. Nat. Poiss. p. 346 (1847); Sauvage, Hist. Madagascar Poiss. p. 495.

? *Clupeonia fasciata*, Cuv. & Val. t. c. p. 349.

*Clupea gibbosa*, Bleek. Journ. Ind. Arch. iii. 1849, p. 72; and Atl. Ichth. vi. p. 106, Clup. pl. viii. fig. 6 (1872).

*Spratella tembang*, Bleek. Verh. Bat. Gen. xxiv. 1852, Haringacht. p. 28.

*Clupea tembang* (part.), Günth. Cat. Fish. vii. p. 426 (1868).

*Clupea fimbriata* (part.), Day, Fish. India, p. 637; Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 75, fig. 26 (1913).

Depth of body  $3\frac{1}{2}$  to 4 in the length, length of head 4 to  $4\frac{1}{3}$ . Snout as long as or longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  or  $\frac{1}{3}$  of eye. 50 to 55 gill-rakers on lower part of anterior arch. 44 to 48 scales in a longitudinal, 11 to 13 in a transverse series; ventral scutes 18-20 + 13-15. Dorsal 17-20. Anal 17-19. Pelvics 8-rayed, somewhat in advance of middle of dorsal. A dark spot at base of anterior dorsal rays; upper part of dorsal and posterior edge of caudal often dusky.

Indian Ocean and Archipelago.

Eleven specimens, 100 to 160 mm. in total length, from Durban, Mombasa, Ganjam, Madras, Siam, Celebes, Java, and Amboyna, including the type of *S. tembang*.

12. *Sardinella melanura*.

*Clupanodon sinensis*, var., Lacep. Hist. Nat. Poiss. v. pl. xi. fig. 3 (1803).

*Clupea melanura*, Cuv. Règne Anim. ed. 2, ii. p. 318 (1829).

*Clupeonia commersoni*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 350 (1847); Sauvage, Hist. Madagascar Poiss. p. 494 (1891).

*Spratella fimbriata*, Bleek. Verh. Batav. Genootsch. xxiv. 1852, Haringacht. p. 27.

*Harengula melanurus*, Bleek. Nat. Tijdschr. Ned. Ind. v. 1853, p. 245.

*Clupea atricauda*, Günth. Cat. Fish. vii. p. 426 (1868); Bleek. Atl. Ichth. vi. p. 106, Clup. pl. x. fig. 5 (1878); Day, Fish. India, p. 636, pl. clxiv. fig. 5 (1878); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 80 (1913).

*Clupea sundaica*, Bleek. Atl. Ichth. vi. p. 105, Clup. pl. xiii. fig. 5 (1872).

? *Harengula melanura*, Sauvage, Hist. Madagascar Poiss. p. 492, pl. xlvi. fig. 4.

Depth of body  $3\frac{1}{2}$  to 4 in the length, length of head 4 to  $4\frac{1}{4}$ . Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 38 to 44 gill-rakers on lower part of anterior arch. 44 to 46 scales in a longitudinal series, 12 or 13 in a transverse series; ventral scutes sharply keeled, 19-20+13. Dorsal 18-19. Anal 16-18. Pelvics 8-rayed, below or a little in advance of middle of dorsal. A dark spot at base of anterior dorsal rays; ends of caudal lobes usually blackish.

Indian Ocean and Archipelago.

Four specimens, 115 to 160 mm. in total length, including two received from Dr. Bleeker as *H. melanurus* and *S. fimbriata*, which appear to be the specimens figured as *C. atricauda* and *C. sundaica*.

13. *Sardinella sirm*.

*Clupea sirm*, Rüpp. Neue Wirbelth. Fische, p. 77, pl. xxi. fig. 1 (1835-40); Günth. Cat. Fish. vii. p. 425 (1868); Weber & Beaufort, Fish. Indo-Austral. Archipel. ii. p. 62 (1913).

*Sardinella leiogaster*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 270 (1847).

*Sardinella leiogastroides*, Bleek. Nat. Tijdschr. Ned. Ind. vii. 1854, p. 255.

*Clupea leiogaster*, Bleek. Atl. Ichth. vi. p. 102, Clup. pl. iv. fig. 6 (1872); Klunzinger, Zool. Bot. Ges. Wien, xxi. 1871, p. 598; Weber & Beaufort, t. c. p. 61.

*Clupea leiogastroides*, Bleek. l. c. Clup. pl. xiv. fig. 2.

*Clupea pinguis*, Günth. Ann. & Mag. Nat. Hist. x. 1872, p. 425, and Brenchley's Cruise of the 'Curacoa,' p. 426 (1873); Weber & Beaufort, t. c. p. 83.

Depth of body  $4\frac{1}{2}$  to 5 in the length, length of head 4 to  $4\frac{1}{2}$ . Snout longer than diameter of eye, which is  $3\frac{2}{3}$  to  $4\frac{1}{3}$  in the length of head; maxillary nearly or quite reaching



vertical from anterior margin of eye. 36 to 40 gill-rakers on lower part of anterior arch. 42 to 45 scales in a longitudinal, 12 in a transverse series; ventral scutes 16-18+13-15. Dorsal 17-19. Anal 17-20. Pelvics 8-rayed, in advance of middle of dorsal.

Indian Ocean and Archipelago.

Six specimens, 105 to 185 mm. in total length, from Zanzibar, Batavia, Celebes, and Misol, including types of *S. liogastroides* and *C. pinguis*.

#### 14. *Sardinella clupeioides*.

*Amblygaster clupeioides*, Bleek. Journ. Ind. Arch. 1849, p. 73.

*Clupea clupeioides*, Günth. Cat. Fish. vii. p. 425 (1868); Bleek. Atl. Ichth. vi. p. 103, Clup. pl. xiv. fig. 1 (1872); Weber & Beaufort, Fish. Indo-Austral. Archipel. ii. p. 63 (1913).

*Clupea okinawensis*, Kishinouye, Journ. Imp. Fisheries Bureau, Tokyo, xiv. 1907, p. 96, pl. xix. fig. 2.

Depth of body  $3\frac{3}{4}$  to  $4\frac{1}{2}$  in the length, length of head 4 to  $4\frac{1}{2}$ . Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{2}$  to 4 in length of head; maxillary not extending to below eye. 27 to 31 gill-rakers on lower part of anterior arch. 42 to 44 scales in a longitudinal, 12 in a transverse series; ventral scutes 16-17+12-14. Dorsal 17-19. Anal 16-18. Pelvics 8-rayed, nearly below origin of dorsal.

Malay Archipelago to Riu-Kiu Islands.

Two specimens, 160 and 230 mm. long, the latter the type of the species.

#### OPISTHONEMA, Gill, 1861.

Proc. Acad. Philadelphia, p. 37.

Differs from *Sardinella* in that the last ray of the dorsal fin is prolonged into a filament.

Two species from Tropical America.

##### 1. *Opisthonema oglinum*.

*Clupea thrissa* (non Linn.), Broussonet, Ichth. fasc. 1 (1872); Günth. Cat. Fish. vii. p. 432 (1868).

*Megalops oglina*, Lesueur, J. Ac. Philad. i. 1817, p. 359.

*Opisthonema oglinum*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 432.

Depth of body  $2\frac{4}{5}$  to  $3\frac{2}{3}$  in the length, length of head 4 to  $4\frac{2}{3}$ . Snout as long as or a little longer than diameter of eye, which is  $3\frac{1}{3}$  to 4 in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 65 (young) to 100 gill-rakers on lower part of anterior arch. 48 to 50 scales in a longitudinal,

15 or 16 in a transverse series; ventral scutes 17-20 + 13-16. Dorsal 18-20. Anal 22-25. Pelvics 8-rayed, a little in advance of middle of dorsal.

Carolina to Brazil.

Several examples, 85 to 275 mm. in total length.

## 2. *Opisthonema libertatis*.

*Meletta libertatis*, Günth. Proc. Zool. Soc. 1866, p. 603.

*Clupea libertatis*, Günth. Cat. Fish. vii. p. 433 (1868).

*Opisthonema libertate*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 433.

*Clupea (Opisthonema) bulleri*, Regan, Ann. & Mag. Nat. Hist. (7) xiii. 1904, p. 255.

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$  to  $4\frac{1}{5}$ . Snout as long as or longer than diameter of eye, which is  $3\frac{2}{3}$  to 5 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  or nearly to middle of eye. 85 (young) to 165 gill-rakers on lower part of anterior arch. 48 to 50 scales in a longitudinal, 14 to 16 in a transverse series; ventral scutes 17-19 + 14-16. Dorsal 17-19. Anal 19-21. Pelvics 8-rayed, a little in advance of middle of dorsal.

Pacific coast of Mexico and Central America; Galapagos Islands.

Several examples, 75 to 250 mm. in total length.

## HARENGULA, Val. 1847.

Cuv. & Val. Hist. Nat. Poiss. xx. p. 277.

This genus has never been properly distinguished from *Sardinella*, but they differ in some important characters. In *Sardinella*, as in *Sardina*, the two last rays of the anal fin are enlarged and the transverse grooves on the scales are paired, their inner ends separated by an interspace. In *Harengula* the posterior anal rays are equal and the transverse grooves on the scales are continuous; moreover, the lower jaw is more prominent and the sheath at the base of the dorsal fin is lower than in *Sardinella*. I count 39 vertebræ in *H. dispilonotus*, 40 in *H. maculosa* and *H. castelnau*, 41 in *H. pensacola*, 42 in *H. schrammi*, 43 in *H. zunasi*, 43 or 44 in *H. macrophthalma*, and 44 in *H. punctata*.

Like *Sardinella*, this genus occurs in the tropical Indo-Pacific; but whereas *Sardinella* has four West African and Mediterranean and only one Antillean species, *Harengula* has four species on the coasts of Tropical America, but is absent from the eastern Atlantic.

The species are mostly smaller and of less economic value than those of *Sardinella*, and some of them are reputed poisonous [cf. Cuv. & Val. xx. p. 295 (*H. humeralis* = *macrophthalma*) and p. 377 (*Meletta venenosa* = *H. punctata*)].

### Synopsis of the Species.

#### I. American.

##### A. 27 to 33 gill-rakers on lower part of anterior arch.

i. Depth of operculum 2, diameter of eye  $2\frac{2}{3}$  to 3 in length of head; depth of body 3 to  $3\frac{1}{2}$  in the length.

1. *maculosa*.

ii. Depth of operculum more than  $\frac{1}{2}$  length of head, diameter of eye 3 to  $3\frac{1}{3}$  in length of head.

Anal of 16-19 rays. Depth  $3-3\frac{2}{3}$  in the length, head  $3\frac{1}{3}$  to  $3\frac{2}{3}$  .....

2. *macrophthalma*.

Anal of 15 rays. Depth  $2\frac{2}{3}$  ( $-3\frac{1}{3}$ ) in the length, head  $3\frac{1}{4}$  .....

3. *thrissina*.

B. 33 to 36 gill-rakers on lower part of anterior arch; depth of operculum  $\frac{2}{3}$  to  $\frac{3}{4}$  length of head; eye  $2\frac{1}{4}$  to 3 in head; depth of body  $2\frac{3}{4}$  to  $2\frac{1}{2}$  in the length .....

4. *pensacolæ*.

#### II. Indo-Pacific.

A. 35 gill-rakers on lower part of anterior arch; 36 to 38 scales in a longitudinal series .....

5. *dispilonotus*.

B. 30 to 34 gill-rakers on lower part of anterior arch; 40 to 45 scales in a longitudinal series.

Depth of body  $2\frac{2}{3}$  in the length .....

6. *koningsbergeri*.

Depth of body  $3\frac{1}{3}$  to 4 in the length, length of head  $3\frac{1}{3}$  to 4; eye 3 to  $3\frac{1}{2}$  in length of head .....

7. *punctata*.

Depth of body 4 to  $4\frac{1}{4}$  in the length, length of head 4 to  $4\frac{2}{5}$ ; eye  $3\frac{1}{2}$  to  $3\frac{3}{4}$  in length of head .....

8. *schrammi*.

C. More than 40 gill-rakers on lower part of anterior arch.

1. Depth of body  $2\frac{1}{2}$  to  $3\frac{1}{5}$  in length; eye 3 in length of head; 45 gill-rakers on lower part of anterior arch.

9. *castelnaui*.

2. Depth of body 3 to 4 in length; eye  $3\frac{1}{3}$  to  $3\frac{3}{4}$  in length of head.

About 50 gill-rakers on lower part of anterior arch;

40 to 42 scales in a longitudinal series; ends of caudal lobes blackish .....

10. *vittata*.

About 50 gill-rakers on lower part of anterior arch;

44 to 46 scales in a longitudinal series; caudal fin uniform .....

11. *zunasi*.

70 gill-rakers on lower part of anterior arch .....

12. *nymphæa*.

#### 1. *Harengula maculosa*.

*Harengula maculosa*, Cuv. & Val. Hist. Nat. Poiss. xx. 1847, p. 292.

*Alosa apicalis*, Müll. & Trosch. in Schomburgk, Hist. Barbadoes, p. 675 (1848).

*Harengula jaguana*, Poey, Rep. i. p. 190 (1866).

*Clupea macrophthalma*, Günth. Cat. Fish. vii. p. 421.

*Sardinella sardina*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 430.

*Sardinella macrophthalmus*, Jord. & Everm. *l. c.*

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{1}{3}$  to  $3\frac{1}{2}$ . Snout shorter than or nearly as long as diameter of eye, which is  $2\frac{2}{3}$  to 3 in the length of head and greater than its distance from lower edge of præoperculum; maxillary extending to below anterior part or middle of eye; depth of operculum  $\frac{1}{2}$  length of head. 27 to 33 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal and 11 in a transverse series; ventral scutes 15-17+10-12. Dorsal 17-19. Anal 17-19. Pelvics 8-rayed, below middle of dorsal. Anterior part of dorsal blackish superiorly. Vertebrae 40.

Several examples, 90 to 200 mm. in total length, from Florida, the Bermudas, and the West Indies.

## 2. *Harengula macrophthalmus*.

*Clupea macrophthalma*, Ranzani, Nov. Com. Ac. Sc. Inst. Bonon. v. 1842, p. 320, pl. xxiii.

*Harengula latulus*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 280, pl. 595 (1847).

*Harengula clupeola*, Cuv. & Val. *t. c.* p. 289.

*Harengula humeralis*, Cuv. & Val. *t. c.* p. 293.

*Alosa striata*, Cuv. & Val. *t. c.* p. 429.

*Alosa bishopi*, Müll. & Trosch. in Schomburgk, Hist. Barbadoes, p. 675 (1848).

*Harengula sardina*, Poey, Mem. ii. p. 310 (1860).

*Clupea humeralis* (part.), Günth. Cat. Fish. vii. p. 422 (1868).

*Sardinella humeralis* (part.), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 431.

Depth of body 3 to  $3\frac{2}{3}$  in the length, length of head  $3\frac{1}{3}$  to  $3\frac{2}{3}$ . Snout shorter than diameter of eye, which is 3 to  $3\frac{1}{3}$  in the length of head and not greater than its distance from lower edge of præoperculum; maxillary extending to below anterior  $\frac{1}{3}$  of eye or beyond; depth of operculum more than  $\frac{1}{2}$  length of head. 29 to 33 gill-rakers on lower part of anterior arch. About 42 scales in a longitudinal and 11 in a transverse series; ventral scutes 16-19+12-14. Dorsal 16-19. Anal 16-19. Pelvics 8-rayed, below middle of dorsal. A dark humeral spot. Vertebrae 43-44.

Atlantic coast of Tropical America\*.

Numerous examples, 80 to 130 mm. in total length, from Florida, the West Indies, Fernando Noronha, and Bahia.

\* Valenciennes described *H. latula* as a European species; it is probable that this was a mistake, although it is not impossible that the species may cross the Atlantic.

### 3. *Harengula thrissina*.

*Clupea thrissina*, Jord. & Gilb. Proc. U.S. Nat. Mus. 1882, p. 353.

*Sardinella thrissina*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 430.

Depth of body  $2\frac{5}{6}$  ( $-3\frac{1}{3}$ ) in the length, length of head  $3\frac{3}{4}$ . Snout a little shorter than diameter of eye, which is  $3\frac{1}{4}$  in the length of head and rather less than its distance from lower edge of præoperculum; maxillary extending a little beyond anterior  $\frac{1}{3}$  of eye; depth of operculum more than  $\frac{2}{3}$  length of head. 30 gill-rakers on lower part of anterior arch. 40 scales in a longitudinal and 12 in a transverse series; ventral scutes 18 + 11 (16 + 13). Dorsal 17. Anal 15. Pelvics 8-rayed, below middle of dorsal. A dark humeral spot.

Pacific coast of Mexico.

A single specimen, 115 mm. in total length, from Jalisco.

### 4. *Harengula pensacolæ*.

*Clupea humeralis* (part.), Günth. Cat. Fish. vii. p. 422 (1868).

*Harengula pensacolæ*, Goode & Bean, Proc. U.S. Nat. Mus. 1879, p. 152.

*Sardinella humeralis* (part.), Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 431.

*Sardinella sardina*, Jord. & Everm. t. c. 1900, fig. 193.

Depth of body  $2\frac{2}{5}$  to  $2\frac{3}{4}$  in the length, length of head  $3\frac{2}{5}$  to  $3\frac{1}{2}$ . Snout shorter than diameter of eye, which is  $2\frac{3}{4}$  to 3 in length of head and equal to its distance from lower edge of præoperculum; maxillary extending to below anterior  $\frac{1}{3}$  of eye or beyond; depth of operculum  $\frac{2}{3}$  to  $\frac{2}{5}$  length of head. 33 to 36 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal and 11 in a transverse series; ventral scutes 16-17 + 13. Dorsal 16-18. Anal 16-18. Pelvics 8-rayed, below middle of dorsal. Vertebrae 41.

Four specimens, 80 to 140 mm. in total length, from Florida and Trinidad.

### 5. *Harengula dispilonotus*.

*Harengula dispilonotus*, Bleek. Nat. Tijdschr. Ned. Ind. iii. 1852, p. 456.

*Clupea dispilonotus*, Günth. Cat. Fish. vii. p. 429 (1868); Bleek. Atl.

Ichth. vi. p. 111, Clup. pl. iii, fig. 3 (1872); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 69 (1913).

Depth of body 3 to  $3\frac{1}{2}$  in the length, length of head  $3\frac{3}{4}$  to 4. Snout a little shorter than diameter of eye, which is 3 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 35 gill-rakers on lower part of anterior arch. 36 to 38 scales in a longitudinal, 11 or 12 in a transverse series;

ventral scutes 14-16 + 11-13. Dorsal 18-20. Anal 16-18. Pelvics below anterior  $\frac{1}{2}$  of dorsal. A dark spot or ocellus on back at base of posterior dorsal rays, a second behind it.

E. Indian Archipelago.

Six specimens, 75 to 100 mm. in total length, including the type of the species.

### 6. *Harengula koningsbergeri*.

*Clupea koningsbergeri*, Weber & Beaufort, Verh. Akad. Amsterdam, xvii. no. 3, 1912, p. 14; Fish. Indo-Austral. Arch. ii. p. 72 (1913).

Depth of body  $2\frac{3}{4}$  in the length, length of head  $3\frac{3}{4}$ . Snout shorter than diameter of eye, which is  $2\frac{3}{4}$  in length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or a little beyond. 33 gill-rakers on lower part of anterior arch. 42 scales in a longitudinal and 12 in a transverse series; ventral scutes 17-18 + 11-12. Dorsal 18-19. Anal 20-21. Pelvics below or a little in advance of middle of dorsal.

A specimen of 115 mm. from N.W. Australia, and one of 75 mm. from New Guinea; the species was described from the Aru Is.

### 7. *Harengula punctata*.

*Clupea punctata*, Rüppell, Neue Wirbelth. Fische, p. 78, pl. xxi. fig. 2 (1840).

*Clupea quadrimaculata*, Rüppell, t. c. p. 78, pl. xxi. fig. 3.

*Sardinella lineolata*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 272 (1847).

*Harengula punctata*, Cuv. & Val. t. c. p. 297; Sauvage, Hist. Madagascar Poiss. p. 493 (1891).

*Harengula bipunctata*, Cuv. & Val. t. c. p. 298.

*Meletta obtusirostris*, Cuv. & Val. t. c. p. 375.

*Meletta venenosa*, Cuv. & Val. t. c. p. 377.

*Harengula moluccensis*, Bleek. Nat. Tijdschr. Ned. Ind. iv. 1853, p. 609.

*Harengula kunzei*, Bleek. id. xii. 1857, p. 209.

*Harengula spilurus*, Guichenot, in Maillard, Ile de la Réunion Poiss. p. 16 (1865); Sauvage, op. cit. p. 493, pl. xlviii. fig. 3.

*Clupea moluccensis*, Günth. Cat. Fish. vii. p. 427 (1868); Bleek, Atl. Ichth. vi. p. 107, Clup. pl. v. fig. 2 (1872); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 81 (1913).

*Clupea venenosa*, Günth. t. c. p. 449; Weber & Beaufort, t. c. p. 77.

*Clupea kunzei*, Bleek. Atl. Ichth. vi. p. 107, Clup. pl. v. fig. 1 (1872); Day, Fish India, p. 636.

*Clupea dubia*, Bleek. t. c. p. 108.

*Harengula stereolepis*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxii. 1897, p. 759.

*Clupea mizum*, Kishinouye, Journ. Imp. Fisheries Bureau, Tokyo, xiv. 1907, p. 98, pl. xx. fig. 3.

Depth of body  $3\frac{1}{3}$  to 4 in the length, length of head  $3\frac{1}{3}$  to 4. Snout as long as or shorter than diameter of eye, which

is 3 to  $3\frac{1}{2}$  in the length of head, equal to or greater than its distance from lower edge of præoperculum; maxillary extending to below anterior  $\frac{1}{3}$  of eye or a little beyond; depth of operculum about  $\frac{1}{2}$  length of head. 30 to 34 gill-rakers on lower part of anterior arch. 42 to 45 scales in a longitudinal, 11 or 12 in a transverse series; ventral scutes 16-20 + 11-14. Dorsal 17-19. Anal 17-19. Pelvics below or a little in advance of middle of dorsal. Anterior part of dorsal blackish superiorly. Vertebrae 44.

Tropical Indo-Pacific, from E. Africa to the Paumotu Archipelago.

Numerous examples, 60 to 130 mm. in total length, including the types of *H. moluccensis* and *H. kunzei*.

### 8. *Harengula schrammi*.

*Alosa schrammi*, Bleek. Verh. Bat. Gen. xxii. 1849, Bali, p. 11.

*Clupea schrammi*, Bleek. Atl. Ichth. vi. p. 109, Clup. pl. xiv. fig. 3 (1872); Weber & Beaufort, Fish. Indo-Austral Arch. ii. p. 83 (1913).

Depth of body 4 to  $4\frac{1}{4}$  in the length, length of head 4 to  $4\frac{2}{5}$ . Snout a little longer than diameter of eye, which is  $3\frac{1}{2}$  to  $3\frac{2}{3}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 32 to 34 gill-rakers on lower part of anterior arch. About 42 scales in a longitudinal and 12 in a transverse series; ventral scutes 17-18 + 12. Dorsal 18-19. Anal 18-19. Pelvics 8-rayed, below or a little in advance of middle of dorsal. Vertebrae 42.

Malay Archipelago.

Four specimens, 100 to 115 mm. in total length, from Misol and Goram; with these I have compared the type, a small fish in bad condition.

### 9. *Harengula castelnaui*.

*Kowala castelnaui*, Ogilby, Proc. Linn. Soc. N.S. Wales, xxii. 1897, p. 66.

Depth of body  $2\frac{1}{2}$  to  $3\frac{1}{5}$  in the length, length of head about 4. Snout a little shorter than diameter of eye, which is 3 in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  or middle of eye. 45 gill-rakers on lower part of anterior arch. 40 to 42 scales in a longitudinal, 12 in a transverse series; ventral scutes 16-19 + 10-13. Dorsal 17-19. Anal 18-21. Pelvics below middle or anterior  $\frac{1}{2}$  of dorsal. Tip of dorsal and ends of caudal lobes blackish.

New South Wales.

Nine specimens, 130 to 180 mm. in total length.

10. *Harengula vittata*.

*Clupeonia vittata*, Cuv. & Val. Hist. Nat. Poiss. xx. p. 352 (1847).

*Alosa melanurus*, Cuv. & Val. t. c. p. 441.

*Clupeonia jussieu*, Cuv. & Val. op. cit. pl. 599.

*Clupea melanura*, Günth. Cat. Fish. vii. p. 449 (1868); Bleek. Atl. Ichth. vi. p. 111, Clup. pl. xi. fig. 5 (1872); Weber & Beaufort, Fish. Indo-Austral. Arch. ii. p. 72 (1913).

*Harengula vanicoris*, Jord. & Seale, Bull. U.S. Bureau Fisheries, xxv. 1906, p. 187.

*Clupea rechingeri*, Steind. Sitzungsab. Akad. Wien, cxv. 1906, p. 1424.

Depth of body  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in the length, length of head  $3\frac{3}{4}$  to 4. Snout as long as diameter of eye, which is  $3\frac{2}{5}$  to  $3\frac{3}{5}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or beyond. 50 gill-rakers on lower part of anterior arch. 40 to 42 scales in a longitudinal, 12 in a transverse series; ventral scutes 17+13. Dorsal 16. Anal 18-19. Pelvics below anterior  $\frac{1}{2}$  of dorsal. Basal part of caudal dusky; ends of lobes blackish.

Indo-Pacific.

Two specimens, 80 and 90 mm. in total length, from Celebes and Raiatea.

11. *Harengula zunasi*.

*Clupea kowal* (non Rüpp.), Schleg. Faun. Japon. Poiss. p. 235, pl. vii. fig. 1 (1846).

*Harengula zunasi*, Bleek. Verh. Bat. Gen. xxvi. 1854, p. 117.

*Clupea kowal* (part.), Günth. Cat. Fish. vii. p. 450 (1868).

*Clupea zunasi*, Günth. t. c. p. 451; Kishinouye, Journ. Imp. Fisheries Bureau, Tokyo, xiv. 1907, p. 98, pl. xx. fig. 4.

Depth of body  $3\frac{1}{3}$  to  $3\frac{4}{5}$  in the length, length of head 4 to  $4\frac{1}{2}$ . Snout nearly as long as or shorter than diameter of eye, which is  $3\frac{1}{3}$  to  $3\frac{2}{3}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye or beyond. About 50 gill-rakers on lower part of anterior arch. 42 to 46 scales in a longitudinal series, 11 or 12 in a transverse series; ventral scutes 17-20+11-15. Dorsal 17-19. Anal 17-20. Pelvics below anterior  $\frac{1}{2}$  of dorsal.

China, Corea, and Southern Japan.

Several specimens, 90 to 140 mm. in total length, from Amoy, China, and from Japan.

12. *Harengula nymphæa*.

*Clupea nymphæa*, Richards, Ichthyol. China, p. 304 (1848); Günth. Cat. Fish. vii. p. 428 (1868).

Depth of body  $3\frac{1}{2}$  in the length, length of head 4. Snout



as long as diameter of eye, which is  $3\frac{1}{2}$  in the length of head; maxillary extending to below anterior  $\frac{1}{3}$  of eye. 70 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal and 13 in a transverse series; ventral scutes 18+11. Dorsal 17. Anal 20. Pelvics 8-rayed, a little in advance of middle of dorsal.

China.

Here described from the type, 120 mm. in total length.

LILE, Jordan & Evermann, 1896.

Bull. U.S. Nat. Mus. xlvii. p. 429.

This genus is close to *Harengula*, but is distinguished by the well-defined bluish-silvery lateral band and by the absence of scales on the lobes of the caudal fin. The dermal fold on the edge of the cleithrum described in *Sardinella*, which is developed to a greater or less extent in *Harengula*, is absent in this genus.

Three species from America.

1. *Lile stolidifera*.

*Clupea stolidifera*, Jord. & Gilbert, Proc. U.S. Nat. Mus. 1881, p. 339.

*Sardinella stolidifera*, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 431, and 1900, fig. 194.

Depth of body  $3\frac{1}{5}$  to 4 in the length, length of head  $4\frac{1}{4}$  to  $4\frac{3}{4}$ . Diameter of eye 3 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye. 36 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal, 10 or 11 in a transverse series; ventral scutes 16-18+10-12. Dorsal 15-17; origin nearer to end of snout than to base of caudal. Anal 16-19. Pelvics 8-rayed, below anterior rays of dorsal. A silvery lateral band; ends of caudal lobes blackish. Vertebrae 40 (42).

Pacific coast of Mexico.

Eight specimens, 90 to 100 mm. long.

2. *Lile piquitinga*.

*Sardinella piquitinga*, Schreiner & Ribeiro, Arch. Mus. Rio Janeiro, xii. 1903, p. 72.

Depth of body about  $3\frac{1}{2}$  in the length, length of head  $3\frac{3}{4}$  to 4. Diameter of eye  $2\frac{3}{4}$  in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye. 33 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal and 10 in a transverse series; ventral scutes 16-17+10-11.

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Dorsal 15-18; origin nearer end of snout than base of caudal. Anal 17-19. Pelvics 8-rayed, below anterior part of dorsal. A silvery lateral band. Vertebrae 40.

Coast of Brazil.

Three specimens, 80-90 mm. long, from Pernambuco.

### 3. *Lile platana*, sp. n.

Depth of body 3 in the length, length of head 4. Diameter of eye 3 in length of head; maxillary extending to below anterior  $\frac{1}{4}$  of eye; 23 gill-rakers on lower part of anterior arch. About 40 scales in a longitudinal series; ventral scutes 18+10. Dorsal 14; origin equidistant from end of snout and base of caudal. Anal 18. Pelvics below origin of dorsal. A silvery lateral band.

La Plata.

A single specimen of 45 mm.

## HERINGIA.

*Heringia*, Fowler, Proc. Acad. Philadelphia, lxiii. 1911, p. 207.

*Rhinosardinia*, Eigenmann, Mem. Carnegie Mus. v. 1912, p. 445.

Form moderately elongate, strongly compressed; abdomen sharp-edged. Mouth small, toothless; lower jaw rather prominent, upper without distinct notch; maxillary with a retrorse spine near its proximal end; 2 supramaxillaries. Operculum smooth; suboperculum rounded. Dorsal median, of 13 to 15 rays, without scaly sheath; anal of 15 to 17 rays, with a low scaly sheath; caudal forked, scaly at base, without alar scales. Pelvics 8-rayed, a little in advance of dorsal. 38 to 40 scales in a longitudinal, 9 or 10 in a transverse series; each scale crossed by a transverse groove, from which 2 (fewer anteriorly, more posteriorly) run backwards to the free edge, which is entire. Vertebrae 39.

### 1. *Heringia amazonica*.

*Clupea amazonica*, Steind. Sitzungsab. Akad. Wien, lxxx. pt. 1, 1880, p. 183.

*Rhinosardinia serrata*, Eigenm. Mem. Carnegie Mus. v. 1912, p. 445, pl. lxii. figs. 3, 4.

Depth 3 to  $3\frac{1}{2}$  in length, length of head  $4\frac{1}{2}$  to 5. Diameter of eye 3 to  $3\frac{1}{4}$  in length of head; maxillary extending to below anterior margin or anterior  $\frac{1}{4}$  of eye. 35 gill-rakers on lower part of anterior arch. 38 to 40 scales in a longitudinal, 9 or 10 in a transverse series; ventral scutes keeled

and pointed, 16-17+10-11. Dorsal 13-15; origin nearer end of snout than base of caudal. Anal 15-17. Pelvics a little in advance of dorsal. Silvery; back bluish.

Amazon; rivers of Guiana.

Four specimens, 60 mm. long, co-types of *R. serrata*, from British Guiana.

## 2. *Heringia bahiensis*.

*Pellomula bahiensis*, Steind. Sitzungsab. Akad. Wien, lxxx. 1880, p. 181, pl. iii. fig. 2.

*Sardinella pernambucana*, Schreiner & Ribeiro, Arch. Mus. Rio Janeiro, xii. 1903, p. 72.

Maxillary extending to below anterior  $\frac{1}{3}$  of eye. 42 to 44 scales in a longitudinal series. Dorsal 16-17. Anal 16-18. A more or less distinct bluish-silvery lateral band.

Coast of Brazil.

This species seems to be scarcely distinct from the preceding, examples of which also show a faint lateral band in certain lights.

XXXV.—On new Weevils of the Genus *Mecysmoderes* from India. By GUY A. K. MARSHALL, D.Sc.

## Subfamily CEUTHORRHYNCHINÆ.

### *Mecysmoderes memecylonis*, sp. n.\*

♂. Colour black; the head with moderately dense setiform scales, those in the middle being brown and the others white; the pronotum sparsely set with inconspicuous dark setæ, and with a longitudinal patch of transverse white setæ on the anterior half on each side; the elytra with a longitudinal stripe on the first interval bordering the thoracic spine and composed of small, ovate, overlapping, yellowish-white scales (the basal half of the stripe usually brownish), being continued behind the spine as a double row of elongate brown scales, partly replaced by white ones near the apex; the remaining intervals each bear a single row of similar brown scales, with a few white ones here and there, except along the immediate base, where all the scales are white; the

\* The types of all the species described here are in the British Museum.

lower surface fairly closely covered with separated white scales throughout.

*Head* minutely shagreened, with an indistinct network of raised lines and a strong longitudinal carina on the vertex; the forehead only slightly depressed below the level of the eyes and with a faint central carina. *Rostrum* moderately stout, very slightly widened from the middle to the apex; the basal half shagreened, with a well-marked central carina and another on each side of it, the apical half shining in the middle and with several rows of very shallow punctures at the sides. *Antennæ* with the scape sharply pointed at the apex; the funicle with joint 1 about as long as 2 and twice as thick, 3 a trifle longer than 2, 4 shorter than 2, and 5 and 6 shorter still and bead-like, 5 as long as broad, 6 transverse. *Prothorax* very strongly and regularly convex transversely, the sides about equal to half the basal margin, almost straight and with a moderate apical constriction, the front margin produced into a sharp obtuse angle in the middle, the basal spine very long (more than one-third the length of the elytra), the basal margin forming on each side an angle of about  $75^{\circ}$  with the main axis; the upper surface finely shagreened and dull, with a strong complete central carina and a large-meshed reticulation of fine raised lines, without any conspicuous depressions; the dorsal outline moderately curved, sloping gradually from the base to one-third, and thence much more steeply. *Elytra* about as long as their united width at the shoulders and very broadly rounded behind, the humeral slope forming an angle of about  $45^{\circ}$  with the suture; the striae broad, shining, and deeply punctate, the intervals rather narrower, carinate and minutely granulate; the dorsal outline convex, deepest before the middle, sloping gradually to the base and more steeply behind. *Legs* black, clothed with separated setiform white scales, the tarsi piceous; all the femora with a sharp tooth, the dorsal apical fringe of the hind tibia longer than the first tarsal joint, the claws unusually small. *Sternum*: the space between the front coxæ as broad as the rostrum; the meso- and metasternum broadly excavated, the end of the furrow sloping gradually up to the base of the metasternum, and the mesosternum being almost horizontal.

Length  $1\frac{3}{5}$ – $1\frac{4}{5}$ , breadth  $1\frac{1}{5}$ – $1\frac{1}{3}$  mm.

**MYSORE:** Madhavgi, on leaves of *Memecylon umbellatum* (H. Mann, Pusa Coll.). **ASSAM:** Sylhet (type).

Allied to *M. nigrorufa*, Mots., but, apart from its red-brown colouring, distinctly narrower form, and unarmed femora, that species has the prothorax much more finely

reticulate, its dorsal outline being almost flat, the front margin rounded, and the central carina flattened; the elytra bear a single row of white scales on the first interval behind the thoracic spine, and the other intervals are set with irregular minute dark setæ; and the metasternum is only shallowly excavated in front. The sternal furrow of *M. me-mecylonis* is very similar to that of *M. carinata*, Fst., but in the latter the margins of the apex are overhanging.

*Mecysmoderes verrucosa*, sp. n.

♂. Black or brownish black, shining and sparsely set with very short recumbent white setæ; the elytra with an elongate patch of brown scales along each side of the thoracic spine; the tarsi testaceous.

*Head* unevenly reticulate, with a well-marked central carina running from the vertex to the edge of the interocular depression. *Rostrum* stout, about as long as the front femur, gradually widening from base to apex, somewhat compressed, the greatest depth exceeding the width, the dorsal outline strongly curved, but with a depression at the base and a deep sinuation in the middle; the upper surface rugosely punctate, with a strong central carina (obsolete in the median depression and ceasing a little behind the insertion of the antennæ) and two finer irregular ones on each side. *Antennæ* with the apex of the scape not produced into a sharp point; the funicle with the two basal joints equal in length, 3 rather shorter, 4 again much shorter, 5 and 6 bead-like. *Prothorax* with the sides about as long as half the basal margin, slightly rounded in the posterior half, abruptly narrowed in front, the apical constriction being broad and collar-like, the front margin rounded dorsally and slightly produced in the middle; the whole of the central portion of the disk is raised into a large boss-like prominence, the top of which bears an elevation on each side, the space between them being longitudinally flattened; the upper surface is coarsely reticulate, with a sharp central carina running from the apical edge to the tip of the basal spine, and on each side of it on the apical collar is another sharp carina—these being convergent behind in the type and parallel in a second specimen. *Elytra* about as long as their width at the shoulders, which are very prominent and rounded, the humeral slope forming an angle of about 70° with the main axis; the striæ broad and shallow, rather sinuous, much more irregular than usual, and containing very unequal punctures, the intervals very uneven, bearing elongate tubercles and set with scattered minute

granules; the more conspicuous tubercles are situated as follows:—interval 2 with a small one at the top of the declivity, on interval 3 a small one near the base and a very large one near the middle, on interval 5 a large one near the base and a small one close behind it, on interval 7 a medium one near the shoulder and another about the middle, on interval 9 a large one about the middle, and a large one just behind the shoulder on interval 10; near the apex a transverse row of tubercles on intervals 3–7, those on 5 and 6 being elongate and the others short; behind these is a broad transverse impression. *Legs* rather long, with scattered recumbent short white setæ; the femora rugosely punctured, armed with a stout tooth, and transversely impressed externally near the apex; the tibiæ rather slender, scarcely dilated at the apex and there clothed externally with golden-brown hairs, which form a dorsal fringe hardly as long as the first tarsal joint. *Sternum*: the mesosternum sloping very steeply and very shallowly impressed in the middle to receive the apex of the rostrum, the metasternum not excavated, and the space between the front coxæ as wide as the rostrum.

Length  $2\frac{1}{5}$ – $3\frac{3}{5}$ , breadth  $2$ – $2\frac{1}{2}$  mm.

ASSAM: Patkai Hills (*W. Doherty*).

A strikingly distinct species.

*Mecysmoderes metasternalis*, sp. n.

♂. Colour varying from black to red-brown, variegated with brown, yellowish and white scales or setæ; the head with fairly dense narrow white scales; the prothorax with the entire sides and lower surface bearing close whitish scales and setæ, a triangular patch of white setæ on the apical third of the median area (its base on the front margin), and some pale setæ on each side of the basal third of the central carina, thus leaving a broad, roughly X-shaped, bare discal patch; the elytra with a very long raised stripe of scales on each side of the thoracic spine extending for more than half their length, the basal two-thirds being very dark brown, the apical third whitish; these scales are very closely packed and obliquely raised or almost erect; a large lanceolate sub-humeral patch of dense whitish scales (continuous with similar scaling on the whole lower surface), the inner edge of which reaches the sixth stria at the base and extends obliquely backwards to nearly the middle of the lateral margin; the apical margin and the posterior half of the lateral margin with an irregular edging of white scales, and a row of yellowish scales on the basal fourth of the second interval;

the rest of the elytra clothed with dark brown scales variegated with narrower light brown and white scales, and with a conspicuous spot of broader white scales before the middle on the eighth interval.

*Head* with the inner edge of the eyes strongly raised above the general level; the forehead very narrow, not broader than the antennal club, and broadly impressed behind; the vertex rugosely punctured, with a well-marked central carina and densely clothed with elongate pale scales. *Rostrum* piceous black, with the extreme apex reddish; long, slender, and cylindrical, extending beyond the middle of the metasternum; rather dull and very finely aciculate, with two short indistinct furrows on each side at the base, and no central carina; the punctures indistinct at the base, shallow and widely separated for most of the length, and deeper near the apex. *Antennæ* testaceous; the scape without any apical process; the three basal joints of the funicle subequal in length, joints 4 and 5 a little longer than broad, 6 almost globular. *Prothorax* with the basal spine very long, about as long as the prothorax, and extending along nearly two-thirds of the elytral suture; the sides (viewed vertically) almost straight and shorter than half the basal margin; the front margin somewhat produced dorsally, the produced portion elevated and truncate in the middle, so that when seen from in front it appears as a flattened triangle; the upper surface covered with large irregular reticulate punctures, the median area raised and strongly compressed in the anterior half, being bounded by a sharp carina on each side to about the middle, the central carina well-marked throughout; the dorsal outline distinctly convex and deepest about the middle; the scales on the sides of the prothorax are mostly setiform, but there is a patch of much broader scales just below the outer carina and another patch some distance below that. *Elytra* about as long as broad; the striæ broad and deep, with large punctures and without rows of scales, except in the first stria; the intervals somewhat broader than the striæ and irregularly granulate; the scales on the greater part of the surface are small, narrow, parallel-sided, and truncate at the tip, but those in the raised patch along the suture, in the basal stripe on interval 2, the subhumeral patch, and the white border are broader and elliptical in shape. *Legs* piceous, the tarsi paler; the femora densely clothed with broad pale scales and all with a strong tooth; the dorsal apical fringe of the posterior tibiæ much longer than the first tarsal joint. *Sternum* with the front coxæ widely separated; the mesosternum almost horizontal and broadly and shallowly impressed; the metasternum with

a broad and deep furrow throughout, which is quite open at the posterior margin.

Length  $2\frac{1}{2}$ , breadth 2 mm.

BURMA: Tavoy, Tenasserim (*W. Doherty*).

The most striking features of this species are the structure of the front margin of the pronotum, the very long prothoracic spine, the elevated sutural scales on the elytra, and the open continuous furrow on the metasternum.

*Mecysmoderes subhumeralis*, sp. n.

♂. Colour varying from piceous black to red-brown, the upper surface sparsely clothed with yellowish hair-like scales; the sutural patch of scales on the elytra extending for about one-third of their length, the basal two-thirds of the patch being black and the apical third whitish; on the seventh interval of the elytra there is a small spot of white scales before the middle; the lower surface sparsely clothed with pale scales, except for a dense patch on the upper half of the mesosternal epimeron.

*Head* reticulate, the central carina continued well on to the forehead, which is almost as broad as the base of the rostrum and strongly impressed. *Rostrum* short and very stout, hardly longer than the front femur and only just reaching the metasternum, parallel-sided in the basal two-thirds, slightly wider at the apex, its dorsal outline strongly convex, and its depth greater than its width in the middle; the upper surface with indistinct confluent punctation, a strong central carina for three-fourths its length, and a less distinct lateral one. *Antennæ* testaceous; the scape without an apical process; the funicle with joints 1 and 2 subequal, 3 distinctly shorter, 4 longer than broad, 5 and 6 subglobular. *Prothorax* with the sides equal to half the basal margin, straight from the base to beyond the middle and then rather abruptly constricted; the basal margin more nearly transverse than in most species, the spine short, about one-fourth the length of the suture; the front edge truncate dorsally and narrowly marginate; the whole discal area forming a rounded elevation laterally compressed in the anterior half, irregularly and unequally reticulate, with a strong and complete central carina, on each side of it in the front half a short carina that does not reach the margin, and beyond this another irregular sinuate one that does reach the margin. *Elytra* about as long as their greatest width, the striae broad and deep, with separated punctures and each with a single row of distant minute white setae; the intervals costate and scarcely broader



than the striae, each with a row of small granules bearing short recumbent setae and some scattered yellowish hair-like scales (especially in the basal half). *Legs* piceous, with the tarsi paler; the femora rugosely subgranulate, with sparse whitish hair-like scales and each with a small tooth; the dorsal apical fringe of the hind tibia not longer than the first tarsal joint. *Sternum* with the front coxae widely separated, but not enough to receive the whole rostrum; the mesosternum not impressed and sloping steeply; the metasternum simple.

Length  $2\frac{2}{5}$ , breadth  $1\frac{3}{5}$  mm.

ASSAM: Patkai Hills (W. Doherty, type); Sudiya (Doherty).

Very similar superficially to *M. memecylonis*, sp. n., but differing markedly in the structure of the sternum, non-angulate front margin of the prothorax, short thoracic spine, short third funicular joint, setigerous elytral striae, etc.

*Mecysmoderes pusio*, sp. n.

♂ ♀. Colour piceous, with greyish-white scaling, the rostrum and tarsi often paler; the scales on the head are narrow and fairly dense; on the pronotum they are more hair-like and sparser on the disk, being shorter and denser at the sides and margins and in the central furrow; on the elytra there is a short stripe of almost circular small scales on the basal fourth of the first interval, the remaining intervals each bearing a single regular row of very narrow and short scales, except on intervals 9 and 10, at the bases of 3 and 5, and on the humeral callus, where the scales are duplicated or more numerous; on the lower surface the scales are larger, oval, and fairly close, but usually not quite contiguous.

*Head* shagreened and shallowly reticulate, with an indistinct central carina on the vertex only, the forehead shallowly impressed and broader than the club of the antenna. *Rostrum* long, slender, and cylindrical, not quite reaching the hind margin of the metasternum (♂) or extending slightly beyond it (♀); very faintly tricarinate in the basal part, the more shining apical area with indistinct shallow separated punctures. *Antennae* testaceous, the scape with a short apical pointed process, the funicle with the two basal joints subequal, the third slightly longer. *Prothorax* with the sides about as long as half the basal margin, scarcely rounded and very shallowly constricted at the apex; the basal margin nearly transverse externally, the central spine short, only about one-eighth the length of the suture, the

apical margin truncate dorsally ; the upper surface moderately convex, with well-marked carinate reticulations, except on the apical collar, a broad shallow central furrow from the collar to beyond the middle, containing a deep rounded fovea in front and changing near the base into a low carina that runs on to the spine. *Elytra* about as long as their greatest breadth, the striæ very broad, with deep separated punctures and quite bare, the intervals subcarinate, each with a row of spaced setigerous granules. *Legs* piceous, with the tarsi paler, clothed with separated, long, narrow, pale scales ; the femora with a minute tooth, which is situated much lower down than usual, being about in the middle of the limb and partly concealed by scales ; the dorsal apical fringe of the hind tibiæ hardly as long as the first tarsal joint. *Sternum* with the front coxæ widely separated for the reception of the rostrum ; the mesosternum broadly and deeply excavated, almost horizontal in the middle ; the metasternum with a broad central furrow throughout, which is not enclosed behind.

Length  $1\frac{3}{5}$ , breadth  $1\frac{1}{10}$  mm.

BURMA: Tavoy, Tenasserim (*W. Doherty*).

Very similar to *M. carinatus*, Fst., in which the thorax is of quite the same type and the sculpturing of the elytra is similar ; but that species differs markedly in its metasternum, which has a deep overhanging excavation in its anterior part only, the femora have no tooth, there is no carina on the head, etc.

*Mecysmoderes pectinipes*, sp. n.

Colour black, variegated with grey and brown setæ and scales ; the prothorax clothed above with recumbent setæ only, the brown ones being more numerous on the disk ; the elytra with a sutural stripe of dense whitish scales extending for more than one-third of the suture, the remaining intervals bearing linear scales (not less than two, and more often three deep), which are grey at the base and mostly dark brown elsewhere, variegated here and there with grey scales ; the lower surface rather densely clothed with broad whitish scales. Immature specimens are sometimes testaceous, with the thoracic carina and spine black ; and various intergrades occur between this and the black mature form.

*Head* with coarse close confluent punctation, the central carina indistinct or absent, the forehead not at all impressed. *Rostrum* black, with the apex reddish ; as long as the front

femur (♂) or a little longer (♀), cylindrical, slightly tapering to the apex from the insertion of the antennæ; the upper surface without any distinct carinæ, but closely and confluent punctate from the base to the antennæ, beyond which the punctures are finer and isolated, especially in the ♀. *Antennæ* testaceous; the scape without any apical process; the funicle with joints 1 and 2 subequal, 3 shorter, 4-6 bead-like. *Prothorax* with the sides gently rounded and each about as long as half the basal margin, the apical constriction slight; the basal spine nearly one-third the length of the suture, the apical dorsal margin feebly angulate in the middle; the upper surface is regularly and gently convex, without elevations or depressions, evenly set with longitudinally confluent punctures, with a low, broad, complete central carina and a fine, short, apical one at some distance on each side of it; the dorsal outline almost flat, deepest near the base, and sloping forwards. *Elytra* as long as their greatest width, the striæ broad and deep, and containing single rows of narrow scales; the intervals evidently broader than the striæ, flat, and closely and strongly punctate. *Legs* black, with the tarsi red-brown, rather thinly clothed with narrow pale scales; the femora with a stout tooth; all the tibiæ strongly dilated at the apex, which bears a double row of stout testaceous spines instead of the usual bristles. *Sternum* with the front coxæ so narrowly separated that the rostrum cannot lie between them; the mesosternum almost vertical and not impressed; the metasternum simple.

Length  $2\frac{2}{5}$ - $3\frac{1}{5}$ , breadth  $1\frac{3}{5}$ -2 mm.

MADRAS: Nilgiri Hills (*H. L. Andrewes*).

A very distinct species on account of its dilated and pectinate tibiæ, closely approximated front coxæ, and unimpressed forehead.

*Mecysmoderes tenuirostris*, sp. n.

♀. Colour reddish brown above, with the head, the thoracic carina and spine, and the basal margin of the elytra blackish; the head and pronotum with rather sparse yellowish setæ, the latter with a small patch of ovate whitish scales on each side before the middle just below the outer carina; the elytra with the sutural stripe of ovate scales extending over nearly half the suture, the scales being blackish except for a short distance at the apex, where they are whitish; a few ovate whitish scales at the base of interval 2 and near the apex of the suture, the rest of the intervals being clothed

(usually about three deep) with intermingled yellowish and blackish narrow setiform scales; the lower surface blackish (except the prosternum, which is reddish) and densely clothed with broad ovate whitish scales except on the mesepimeron, the lateral lobe of the mesosternum, and the front half of the metepisternum, where the scales are markedly narrower and have a brownish tinge.

*Head* coarsely and confluent punctate, with a carina on the vertex; the forehead strongly depressed, very broad behind, and narrowing in front to the width of the rostrum. *Rostrum* extremely long and slender, cylindrical and moderately curved, reaching to the hind margin of the first ventral segment; a smooth central line on the basal third and rows of punctures on each side of it, the apical area smooth and impunctate. *Antennæ* testaceous brown, inserted behind the middle of the rostrum; the scape without any apical process; the funicle with joints 1 and 3 subequal, 2 markedly longer, 4 much longer than broad, 5 and 6 globular. *Prothorax* with the sides as long as half the basal margin, gently rounded and rather broadly constricted at the apex, the apical margin being truncate (as seen from above), but raised in the middle so as to form a vertical angle; the basal margin rather less oblique on each side than usual, the spine very long and slender, extending nearly for one-half the suture; the upper surface not very convex, coarsely and subreticulately punctate, with a well-marked and complete central carina, and a prominent carina on each side of it in the anterior half, below which the sides are compressed. *Elytra* as long as their greatest width, the striæ deep but not broad, each containing a row of spaced yellowish scales; the intervals evidently broader than the striæ, flat, and coarsely punctate. *Legs* rather long and slender, clothed with separated yellowish setiform scales; the femora with a stout tooth; the dorsal apical fringe of the hind tibiæ not longer than the first tarsal joint. *Sternum* with the front coxæ moderately widely separated; the mesosternum quite flat and almost vertical; the metasternum simple.

Length  $2\frac{2}{5}$ – $2\frac{3}{5}$ , breadth  $1\frac{1}{5}$ –2 mm.

MADRAS: Nilgiri Hills (*H. L. Andrewes*).

Differs from all the Indian species known to me by its very long and slender rostrum; the unusual length of the second joint of the funicle is also noteworthy.

## XXXVI.—Occurrence of a Holothurian new to the Fauna of Bermuda. By W. J. CROZIER.

(Contributions from the Bermuda Biological Station for Research.—No. 61.)

THE West-Indian affinities of the Bermudan fauna and flora (Britton, 1912, p. 193) have been evident to every student of these regions; yet, as Pilsbry (1900, p. 494) remarks in considering the Pulmonates, there is "abundant evidence of what we call chance, or the rigorous selective action of an over-sea journey, in the Bermudian assemblage." Continued collecting is disclosing further additions to the marine population in the shape of species identical with well-known West-Indian forms\*. In one such case, which is the subject of this note, it seems to me that the addition may legitimately be considered as of recent date.

The pedate Holothurians of Bermuda waters have been collected ever since 1883 by Heilprin, Verrill, Clark (1901), and others. Each of the five species previously reported (*Cucumaria punctata*, *Stichopus möbii*, *Holothuria surinamensis*, *H. captiva*, and *H. rathbuni*) is well represented in the West-Indian area. Certain conspicuous Antillean types have, however, been lacking in the Bermudan collections; *Actinopyga* and several species of *Holothuria* are in this category†.

I have had occasion to examine with care several thousand specimens of *Stichopus möbii*, Semp.—with which, on superficial examination, *Actinopyga* might conceivably be confused,—and have, indeed, given particular attention to Holothurians collected at many points in Bermuda. No unusual specimens were observed until July 3, 1916, when there was secured from a depth of about 6 feet beneath low water, in the channel entrance to Hungry Bay (on the exposed south

\* Among the Enteropneusta, for example, of which an illustrated account is in course of preparation, at least two of the four or more species which I have found occur also in the Bahamas and at Jamaica, as well (probably) as at other stations in the West Indies.

† Of the five apodous species found here (Clark, 1907), only two (*Chirodota rotifera* and *Synaptula hydriformis*) are typically West-Indian, while two others (*Leptosynapta inhaerens* and *L. roseola*) are northern forms; the remaining one (*L. acanthia*) appears to be peculiar to the Bermudas.

shore), an individual which was at once seen to be peculiar. The *Holothurian* was about 25 cm. in length, and of a deep yellowish-brown colour, unmarked by spots of any other hue. Anal teeth were particularly prominent, and the pedicels and ventral surface were tinged with greenish pigment, such as one is accustomed to see in *Holothuria captiva* and in *H. surinamensis* (Crozier, 1915, p. 274). *Stichopus* has no anal teeth, and totally lacks this green pigment. The specimen was unfortunately lost before detailed examination could be given it. Attempts to discover an additional example have thus far been fruitless.

The single specimen observed has, however, considerable zoö-geographical interest. It seems probable, from the external characters above mentioned, that it is an *Actinopyga*, presumably *A. agassizii* (Selenka) \*, which is known from the Bahamas, Florida, Tortugas, Barbadoes, Jamaica, and Hayti (Sluiter, 1910). The inference seems fair that it represents a recent arrival in Bermudan waters, since previous extensive and detailed collecting has failed to reveal its presence, and since only a single specimen has been found. Concerning the method whereby, on this assumption, it came to Bermuda, one can only speculate. It may have been transported either (as a larva) by ocean currents or (as an adult) upon the bottom of a vessel. The latter seems the less probable.

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\* I am indebted to Dr. H. L. Clark for a suggestion regarding the probable identity of the specimen.

XXXVII.—*Descriptions of a new Lizard and Two new Frogs discovered in West Africa by Dr. H. G. F. Spurrell.* By G. A. BOULENGER, F.R.S.

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*Lygosoma spurrelli.*

Section *Emoa*. Habit lacertiform; the distance between the end of the snout and the fore limb is contained once and two-fifths in the distance between axilla and groin. Snout short, obtuse. Lower eyelid with an undivided transparent disk. Supranasals very small; frontonasal broader than long, forming a very broad suture with the rostral and narrowly in contact with the frontal, which is as long as the frontoparietals; frontoparietals and interparietal distinct, latter smaller; four supraoculars; seven superciliaries; sixth upper labial largest and below the eye. Ear-opening moderately large, vertically oval, without lobules anteriorly. 30 smooth scales round the middle of the body, ventrals largest. Marginal præanals not enlarged. The hind limb does not reach the axilla. Digits rather short, feebly compressed; subdigital lamellæ obtusely keeled, 13 under the fourth toe. Tail once and a half the length of head and body, gradually tapering from the base. Dark reddish brown above, nape, back, and limbs with numerous small black and yellow spots; a blackish lateral streak from the nostril, through the eye, to the base of the tail; sides pale brown, without spots; lower parts yellowish white.

	mm.
From snout to vent. ....	48
" " fore limb .....	17
Head .....	10
Width of head .....	8
Fore limb .....	13
Hind limb .....	18
Foot .....	8
Tail .....	74

A single specimen from Obuasi, S. Ashantee.

Closely allied to *L. breviceps*, Peters\*, but with fewer scales round the body.

*Rana leonensis.*

Vomerine teeth in very short oblique series close to the anterior corners of the choanæ. Head much longer than

\* Cf. Boulenger, Ann. Mus. Genova, (3) ii. 1906, p. 206.

broad ; snout pointed, strongly projecting, once and a half the length of the eye ; canthus rostralis distinct ; loreal region feebly oblique, feebly concave ; nostril nearer the end of the snout than the eye ; interorbital space a little broader than the upper eyelid ; tympanum very distinct, two-thirds the diameter of the eye and close to it. Fingers obtuse, first, second, and fourth equal ; subarticular tubercles moderately large, moderately prominent. Hind limb very long, the tibio-tarsal articulation reaching far beyond the tip of the snout ; tibia once and two-fifths in length from snout to vent, longer than the fore limb or the foot. Toes obtuse, broadly webbed, the web reaching the tips of all except the fourth, of which the two distal phalanges are free ; sub-articular tubercles moderately large, moderately prominent ; inner metatarsal tubercle elliptical, half the length of the inner toe ; no outer tubercle ; no tarsal fold. Skin smooth above, with six fine, feebly prominent, interrupted glandular folds along the back ; a stronger fold above the temporal region ; lower parts smooth. Grey above ; a whitish line from the tip of the snout, along the canthus rostralis, to the eye, continued on the temporal fold ; side of head, including the tympanum, dark brown, black above, this dark band continued on the side of the body ; limbs with numerous dark cross-bands ; hinder side of thighs black, variegated with white ; throat and belly yellow ; lower surface of thighs and of inner side of legs bright pink ; plantar surface dark brown, the web variegated with white. Male with blackish external vocal sacs, each protruding through a slit measuring one-third the length of the mandibular ramus and terminating close to the middle of the base of the arm.

From snout to vent 43 mm.

A single male specimen from Bibianaka, Sierra Leone.

Distinguished from *R. æquiplicata*, Werner, by the longer snout, with less oblique and feebly concave loreal region, and the longer fourth finger ; from *R. longiceps*, Peters, by the web not extending to the tip of the fourth toe and the shorter slit for the vocal sac ; from *R. oxyrhynchus*, Sundev., by the well-marked canthus rostralis.

### *Rappia spurrelli.*

Head a little longer than broad ; snout pointed, as long as the orbit, projecting strongly beyond the mouth ; canthus rostralis rounded ; loreal region nearly vertical and feebly concave ; nostril a little nearer the tip of the snout than the eye ; interorbital region a little broader than the upper eyelid ; tympanum hidden. Fingers moderately elongate,



free; disks rather large. Tibio-tarsal articulation reaching the eye; tibia  $2\frac{1}{4}$  times in length of head and body, considerably longer than the foot; toes two-thirds webbed, two phalanges of fourth free; subarticular tubercles small and feebly prominent. Skin smooth above, granular on the belly and under the thighs. Reddish brown above, with four blackish longitudinal streaks; a blackish streak from the nostril to the eye and a dark brown temporal band; lower parts white. Male with a large external subgular vocal sac, covered by a large round flat disk.

From snout to vent 28 mm.

A single specimen from Obuasi, S. Ashantee.

Closely allied to *R. oxyrhynchus*, Blgr., from the Katanga, but distinguished by the total absence of web between the fingers and the presence of the gular disk, as well as by the coloration.

# XXXVIII.—New Species of Indo-Malayan Lepidoptera.

By Colonel C. SWINHOE, M.A., F.L.S., &c.

## Family Lycænidæ.

### *Arhopala dascia*, nov.

♀. Upperside much as in *A. ganesa*, Moore, but darker in colour. Underside with the ground-colour greyish white, markings chocolate-brown; fore wing with a rather broad medial band from the costa to vein 2, the immediate base of the wing chocolate-brown, this colour running up the costa for a short distance, the space between the base and the median band filled up with fine transverse bands close to each other, a discal macular band of square spots which become somewhat diffuse at the hinder angle, the third spot from the costa placed outwards; the marginal space dark; a double row of lunular marks near the margin: hind wing with the whole space, with the exception of a large round patch below the middle of the costa, covered with round spots (white-edged) on a dark ground, very difficult to describe, but exactly similar to Watson's figure, plate A, fig. 6, ♀, Bo. N. H. Soc. x., of a form he likens to *A. ganesa*, remarking that it deserves a distinctive name, but Watson's figure, like *A. ganesa*, has no tails, and *dascia* has tails as in *A. aberrans*, Doherty. I cannot but think that Watson's figure represents a specimen of *dascia* with the tails broken off.

Expanse of wings  $1\frac{2}{10}$  inch.

*Hab.* Toungoo, Burma.

## Family Hesperiidæ.

*Hasora philetas*.

*Ismene philetas*, Plötz, Stett. ent. Zeit. xlv. p. 55 (1884), unpublished plate no. 1159.

*Hasora simplicissima*, Swinhoe (part.), Trans. Ent. Soc. 1908, p. 34.

*Hasora mixta*, Fruhstorfer (part.), Iris, 1911, p. 68.

*Hab.* Philippines.

Fruhstorfer puts *philetas* as a synonym to *mixta*, Mab., but *mixta* like *simplicissima* is a Parata, whereas *philetas* (which Semper wrongly identified in Rhop. Phil.), is a *Hasora*, without the stigma on the fore wing, though the markings are very similar; I have *philetas* male from the Philippines which exactly corresponds with Plotz's figure.

*Notocrypta tobrianda*, nov.

♂ ♀. Somewhat similar to *N. aluensis*, Swinhoe, Ann. & Mag. N. H. (7) xx. p. 434 (1907), from the Solomon Islands, figured in Trans. Ent. Soc. 1908, pl. iii. fig. 11, and *N. wokana*, Plötz (from Aru Isl.), Berl. ent. Zeit. xxix. p. 225 (1885), a copy of Plötz's figure given in the same plate (fig. 9), but in neither sex are there any dots or any other markings above or below, there being only the discal white band of the fore wing which is very much narrower than in either of the above-named species, is much more curved, narrows hindwards in the male into a square spot, is similar in the female, but is of the same width throughout.

Expanse of wings, ♂  $1\frac{6}{10}$ , ♀  $1\frac{8}{10}$  inch.

*Hab.* Kiriwini Isl., Tobriand group.

*Ection elia-eburus*.

*Hesperia eburus*, Plötz, Berl. ent. Zeit. xxix. p. 226 (1885); unpublished plate no. 1373.

*Ection elia-ayankara*, Fruhstorfer, Iris, 1911, p. 19.

*Hab.* Malacca, Perak.

A somewhat variable form, though the type form *elia*, Hew., from Sumatra, is fairly constant.

*Telicota bambusæ kiriwinia*, nov.

♂. Resembles *T. pythias*, Mabille, Pet. Nouve, ii. p. 374 (1878), from Java, Sumatra, and Nias; the markings are very similar, but the colour is paler; the fore wing is longer and the hind wing produced hindwards.

♀. Very different from the females of *pythias*. Upper-side: fore wing nearly all black; an orange streak on the basal half of the costa; a small streak below its outer end; a streak on the median vein from near the base to the origin

of vein 2; a longer streak on the internal vein and a shorter streak from near the base close along the hinder margin of the wing; two orange spots in the disc, and two small spots subapical: hind wing also nearly all black; a streak of orange hairs in the cell, one along the internal vein, and a discal narrow band of four orange spots. Underside: both wings black, marks orange: fore wing with a broad streak close to the costa; from the base to beyond the cell-end, joined to a spot at the upper end of the cell, three discal spots, the upper one pushed outwards; a small dot again outwards, and three subapical: hind wing with a spot at the end of the cell and a discal band as on the upperside; antennæ longer than usual in the group.

Expanse of wings, ♂  $1\frac{1}{2}$ , ♀  $1\frac{1}{10}$  inch.

*Hab.* Kiriwini Isl., Tobriand group.

### Family Deilemeridæ.

#### Section I.

Veins 6 and 7 of hind wing not stalked, palpi short.

#### *Deilemera paradelfa*, nov.

♂ ♀. Belongs to the *pellea* group: Section I. of my "Monograph of the *Deilemeridæ*"\*. Frons white; head and collar luteous; thorax white; a black spot on the head, two on the collar, and the thorax with three black spots down the middle and three on each side; palpi luteous, last joint black; abdomen dull greyish yellow, with pale brown segmental bands: fore wing pale black, with a lilac tinge; spots white, a small round spot in the middle of the cell in the male, developed into a short streak in the female; a large oval spot across the end of the cell, from vein 11 to vein 2; three submarginal spots as in *pellea*; a white streak on the hinder margin from base to a little beyond the middle: hind wing white; a pale black uniform marginal band, running narrowly up the abdominal margin for a short distance, and containing a white subapical spot and a medial spot. Underside: wings as on the upperside; legs ochreous; body white, without markings.

Expanse of wings, ♂ ♀,  $1\frac{7}{10}$  inch.

*Hab.* Fergusson Isl.

#### *Deilemera bouruana*, nov.

♀. Allied to *D. separata*, Walker, xxxi. p. 204 (1864), from Gilolo Island. Pectus white; palpi white, last joint black; frons, head, and thorax white, collar tinged with

\* Trans. Ent. Soc. 1903, pp. 53-84.

ochreous; frons with a black spot, a large one on the head, running in between the antennæ, two on each side of the collar; a black streak down the middle of the thorax and one on each side; abdomen ochreous grey, with black macular segmental bands, marked with white: fore wing black, markings white; a thick streak in the cell, from the base to its middle, another similar but thicker streak immediately below it and extending a little beyond it; a streak on the hinder margin, from the base to beyond the middle; a large, oval, discal, oblique spot from close to the costa, where it is round and small to vein 2, nearer the hinder angle of the wing than is usual in the *pellex* group, in one specimen it runs below vein 2 and is attenuated; three larger submarginal spots. Underside: wings as above; body white with thin segmental bands on the abdomen; legs white striped with black.

Expanse of wings  $1\frac{6}{10}$  inch.

*Hab.* Bouru Isl., South Moluccas.

*Deilemera externa*, nov.

♂ ♀. Face white; palpi black; frons, head, and thorax ochreous; a black spot on the frons, a large one on top of head, covering nearly the whole space and running in between the antennæ, two on the collar, an angular spot behind them followed by an oval black spot on each shoulder; abdomen greyish ochreous, some white specks at the base and thin darker segmental lines touched with white at the sides and a row of black spots on each side: fore wing dark black, markings white; a disjointed thin streak from the base to the middle of the cell; a small spot below it and a little outside; an oval spot in the disc from vein 11 to a little below vein 2, narrow in the type-specimen, broader in others; three submarginal spots, the two lower ones connected together in the type-specimen; a white streak on the hinder margin: hind wing with a rather broad and even marginal black band running thinly up the abdominal margin to the base, and narrowly along the costa, with a knob at its middle; two white spots in the band, and indications of a third spot as in Aurivillius's figure of *pellex*\*, but not so distinct. Underside: wings as above; legs and thorax ochreous; abdomen white with black segmental bands.

Expanse of wings, ♂  $1\frac{6}{10}$ , ♀  $1\frac{7}{10}$  inch.

*Hab.* Batjan Isl., Middle Moluccas.

\* Rec. Crit. in Sv. Ak. Handl. xix. (5) pl. i. fig. 5 (1882).

## Section I. B.

Antennæ shortly pectinated.

*Deilemera gonora*, nov.

♂. Nearest to *D. oroya*, Swinhoe, from Sula Besi. Palpi white, last joint black; frons, head, and thorax white; frons with a black spot, collar with two; two square black spots followed by a round one on the thorax; abdomen white with hardly any markings, tip ochreous; wings white, markings black: fore wing with the veins black; a small patch on the middle of the costa, another on the costa above the cell-end and running into the bar at the end of the cell; a broad black band on the outer margin containing three white subapical spots close together, the middle one the largest, the lower very small, followed by two spots against the black patch above the cell-end, with two white linear marks below them, and large white spot at the middle of the outer margin with a white streak attached to its lower end: hind wing with a fairly broad black outer marginal band, not continued on the costa, its inner margin sinuous and two white spots in it, apical and medial. Underside: wings as above; body white without markings; legs ochreous.

Expanse of wings 2 inches.

*Hab.* Stephensort, Dutch New Guinea.*Deilemera similis*, nov.

♂ ♀. Nearest to *D. burica*, Holland, from Bouru, of which I have a fine series from Bouru; palpi white, last joint black; frons, head, and thorax pale ochreous, nearly white; frons with a black linear spot, another similar spot on the head; thorax with two black spots on each side; abdomen pure white, with small black dorsal and lateral spots: fore wing black, markings white; a broad spear-shaped streak from the base, from the median vein to the internal vein, containing a black dot at its base, two short subcostal streaks above it and two round spots outside it; a broad oblique band divided by the veins into five large spots, the lowest round, the others elongate, the fourth from the costa the largest, and extended both outwards and inwards with a little streak hindwards from its interior end, the third wedged in outwards between the second and the fourth, sometimes with a very small spot attached to its upper side; a little beyond the band is a subcostal spot with another below it; a large double spot subapical and another near the middle of the outer margin: hind wing with a rather broad black band narrowing hindwards, and continued in almost a line on two-thirds of the costa; a white spot on the costa below the

apex, a smaller spot just inside it, and a larger spot near the margin below the middle. Underside: wings as above; body and legs white, tarsi black at the ends.

Expanse of wings, ♂ ♀,  $1\frac{8}{10}$  to 2 inches.

*Hab.* Stephensort, Dutch New Guinea; a fine series.

#### Section II. D.

Veins 6 and 7 of hind wing stalked, palpi longer; male without secondary sexual characters.

#### *Deilemera cenis parva*, nov.

♀. Very similar to *D. cenis*, Cramer, from Sikhim, Silhet, and Assam, but very much smaller, all the spots and bands about half the size.

Expanse of wings  $1\frac{6}{10}$  inch.

*Hab.* Au-San, Central Formosa.

Two females.

#### *Deilemera poliodesma*, nov.

♂ ♀. Head, collar, body, and palpi luteous, last joint black; a black spot on the frons, another on the top of the head, two on the collar, a thick black stripe along the middle of the thorax, and a narrower black stripe on each side; abdomen with black segmental bands above, and black spots on the segments beneath: fore wing black; a broad discal white band divided by the veins into six spots, much as in *D. baulus*, Boisd., from Bouru, but narrower, the uppermost spot small, the veins of the wing from the base to this band dull yellowish: hind wing pure white, a broad marginal black band, angled inwards on vein 2, narrowing on the costa, and running upwards for a short space on the abdominal margin. Underside much as above, but paler, the inner portion of the fore wing suffused with dull ochreous.

Expanse of wings, ♂ ♀,  $1\frac{7}{10}$  inch.

*Hab.* New Britain (New Mecklenburg).

Belongs to the *baulus* group. I have a great number of examples of this group from the different islands, and, though more or less resembling each other, each island seems to contain a form of its own.

#### *Deilemera homogona*, nov.

♂. Allied to *D. lacticinia*, Cramer; the abdomen is without the black segmental bands on the upperside, having merely a row of black dots, decreasing in size hindwards; the fore wing has the discal white band twice the width, more compact, and on the upperside of the small outer white spot (the third from the costa) there is another white spot

attached; the marginal black band of the hind wing is much narrower and decreases in width hindwards.

Expanse of wings  $1\frac{7}{10}$  inch.

*Hab.* Hué, Annam.

*Deilemera perissa*, nov.

♂ ♀. Allied to *D. luctuosa* \*, Vollenhoven, from Batjan Island; palpi, head, and body ochreous, last joint of the palpi black; frons with a black spot in its centre, one on the head, two on the collar; three longitudinal stripes on the throat, a spot at the base of the abdomen followed by segmental black bands: fore wing black, a spear-shaped white band from near the base, widening outwards to the base of vein 2, where it is cut short; a short white streak from the base along the costa, another on the median vein to the base of vein 2, and a similar streak on the internal vein; a fairly broad discal white band of seven white spots joined together, the fourth round and small, between the ends of the third and fifth, the lowest still smaller and oval; in one example, the band from the base is connected with the discal band by a thin white streak and there is a white spot at the end of the cell: hind wing white, with the usual black marginal band, much as in *luctuosa*. Underside as on the upperside; body and legs ochreous, the former spotted with black; the legs with black stripes.

Expanse of wings, ♂ ♀,  $1\frac{1}{2}$  inch.

*Hab.* Obi Isl., Moluccas.

A fine series.

*Deilemera delocyma*, nov.

♂. The antennæ long, the pectinations also somewhat longer than is usual in the group; pectus, frons, head, and thorax dull orange-ochreous; frons with a black spot, one on the neck, two on the collar; thorax with black stripes on the middle and on the sides; abdomen dull orange-ochreous, with black segmental bands, so broad as almost to obliterate the ochreous colour: fore wing long; costa much arched before the apex; colour black, a white stripe below the median vein from the base to the middle; a broad and somewhat upright discal band divided by the veins into seven spots, extending from near the costa to near the hinder margin, the first three from the costa narrow, the fourth oval, wedged in between the outer halves of the third and fifth, the sixth the largest, the seventh small and round-edged: hind wing white, a broad black marginal border, angled at vein 2, and continued narrowly along the costa. Underside: body

\* Tidj. von Dierk. i. p. 42 (1863).

orange-ochreous; abdomen with black segmental bands; legs orange-ochreous striped with black.

Expanse of wings 2 inches.

*Hab.* Flores Isl.

#### Family Orthostixidæ.

*Alex niasica*, nov.

♀. Frons and palpi black, the inner side of the first two joints of the palpi white; ground-colour of the head, body, and wings greyish ochreous; head and collar blackish through thickly covered irrorations; both wings uniformly covered with short brown striations: fore wing with a pale brown mark at the upper end of the cell, both wings with indistinct traces of outwardly curved, pale brown, thin bands, antemedial and discal; a thin, marginal, pale brown line and ochreous cilia with grey tips. Underside as above, but the striations and transverse lines thicker and more prominent.

Expanse of wings 2 inches.

*Hab.* Nias.

Quite distinct from any other species of this genus known to me.

#### Family Geometridæ.

*Pingasa talagi*, nov.

♂. Frons, head, body, and wings greyish white, strongly tinged with ochreous irrorations; palpi with the third joint black, elongate as in *P. aravensis*, Prout\*; wings with the markings pale grey: fore wing with a sinuous blackish thick line closing the cell; a nearly straight short line beyond it from the middle of interspace 3 to near the costa, an indistinct outwardly curved subbasal line; a more distinct and thicker postdiscal line, more or less distinctly macular; a submarginal row of indistinct spots pricked with white on their inner sides, and minute dots on the outer margin; hind wing with a line closing the cell; the two outer marginal bands diffuse and more or less conjoined together and with the outer margin, the white inner marks on the very indistinct submarginal spots more prominent than they are on the fore wing. Underside: wings paler and without irrorations; fore wing with a very large black spot at the end of the cell and a large black upper discal patch attenuated hindwards; three white dots outside the upper part of the black patch; hind wing with a thick black lunular mark at the end of the cell, and a large black upper discal patch as on the fore wing, but without the white dots.

Expanse of wings  $1\frac{7}{10}$  inch.

*Hab.* Tulagi, a small island off Ysabel Island in the Solomon group (*Everett*).

\* Nov. Zool. xxiii. p. 7 (1916).



XXXIX.—*Notes on Myriapoda*.—V.\* *On Cyldindroiulus (Leucoiulus) nitidus (Verhoeff)*. By HILDA K. BRADE, M.Sc., L.R.C.P., M.R.C.S., and the Rev. S. GRAHAM BIRKS, M.Sc.

LAST year Dr. A. Randell Jackson recorded † the finding by one of us ‡ at Winkhill, near Leek, Staffs, of *Cyldindroiulus (Leucoiulus) nitidus* (Verhoeff). This seems to have been the first record of the occurrence of this species in Britain, and the following notes are based primarily upon our study of material from the locality named in the light of the original paper § in which Dr. C. W. Verhoeff describes *Julus nitidus*. Of this description we have made the fullest use, and we here express our indebtedness.

Our specimens were first examined by Dr. Jackson, and then sent to Monsieur le Docteur Henry W. Brölemann of Pau, who, with his usual kindness, dissected one of the males, and identified it as the *Julus nitidus* described by Verhoeff.

#### 1. OCCURRENCE AND HABITAT.

*Cyldindroiulus nitidus* was taken in September 1915 at Winkhill, Staffs, by one of the writers (H. K. B.); three males and two immature specimens were found together under a stone on the grassy sides of the road leading from the station to the village; no adult females were then taken. In September 1916, when we had already made some study of the limited material then at our disposal, we took many specimens of both sexes in the same immediate neighbourhood. In the field *C. nitidus* resembles *C. silvarum* (Meinert) very closely except in habitat. Verhoeff states (*loc. cit.*) that he had noticed this animal only in woods or on heights. He records it in the Rhine and Moselle districts: at Melbthal, near Bonn, in a wood under leaves; at Ippendorfer Höhe, near Bonn, at the edge of a wood under stones; at Cochem, in woods and at Siebengebirge, Petersberg, in woods under stones. There are some trees in the neighbourhood of the ground where the English specimens were collected at Winkhill; but the very limited area of its occurrence is not in close connection with woods, the district being hilly and

\* The authors' previous notes I.—IV. in this series appeared as follows:—I., *Lancs. & Ches. Nat.*, June 1916; II., *ibid.* July 1916; III., 'Irish Naturalist,' August 1916; IV., *Lancs. & Ches. Nat.*, September 1916.

† "On some Arthropods observed in 1915," *Lancs. & Ches. Nat.*, Feb. 1916, p. 391.

‡ H. K. B.

§ "Ein Beitrag zur mitteleuropäischen Diplopoden-Fauna," *Berliner Entomolog. Zeitschrift*, xxxvi. 1, 1891, pp. 115 *et seq.*

rather bleak. Some little distance away, however, there are several well-wooded areas.

The rocks of the neighbourhood are Carboniferous sandstones and shales. There is Carboniferous Limestone not more than 3 miles distant in a southerly direction.

## 2. SYSTEMATIC POSITION.

This species takes its place in the family Julidæ, being referred to the genus *Cylindroiulus* (*Julus* s. l.) and subgenus *Leucoiulus*.

## 3. SOME EXTERNAL CHARACTERS.

### (a) *Dimensions.*

Dr. Verhoeff (*loc. cit.*) gives the following dimensions:—

Male: length 15–20 mm.; breadth 1·0–1·3 mm.

Female: length 18–24 mm., less often up to 29 mm. (as in the case of one example 2 mm. broad); breadth 1·3–2·0 mm.

The dimensions of three males taken at Winkhill in 1915 are:—

Length 14–20 mm.; breadth 1·0–1·3 mm.

And of three females taken at the same place in 1916:—

Length 22–24 mm.; breadth 1·6–1·8 mm.

### (b) *Colour-markings etc.*

The exoskeleton is brightly polished. Each pleurotergite of the trunk is composed, as usual, of a narrow anterior prozonite (fig. 2, *p*) and a broader posterior metazonite (fig. 2, *m*).

In our specimens the general tone of colour is brownish, but the shade varies very much in different specimens from quite dark to fairly light; above the level of the foramina the pleurotergites are relatively dark, and dorsally the segments are distinctly mottled by patches of a greyish tone; passing ventrally the somites get much lighter, and so the mottled appearance is practically absorbed by the general tone of colour. At the level of the foramina a row of distinct brown spots may be seen running along each side of the body. These spots occur on each of the metazonites except those of the first few and last few segments.

Frons and vertex without grooves.

The prozonites are smooth.

The metazonites are marked with longitudinal grooves set widely apart, but these grooves are wanting on the dorsal portions of the most anterior segments (fig. 1).

The ventral plates (sternites) are simple and insignificant.

Fig. 1.

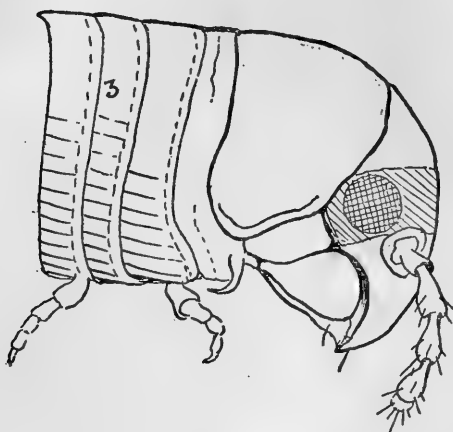


Fig. 2.

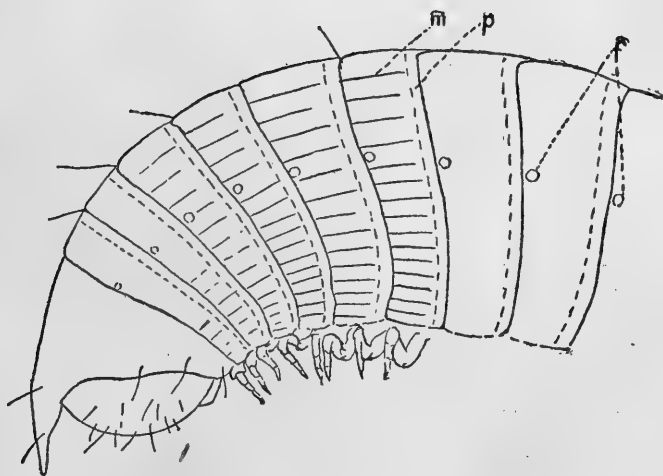


Fig. 1.—*C. nitidus*, anterior end of body of ♂. Details of eye not shown. On the collum segment the characteristic curved groove is clearly seen. 3 is the third body segment.  $\times 36$ . H. K. B. del.

Fig. 2.—Posterior end of same. *f*, foramina repugnatoria; *p*, prozonite; *m*, metazonite.  $\times 36$ . H. K. B. del.

Above the mouth four bristle-bearing dimples are present.

Crossing the head from side to side is a deeply pigmented band on which the eyes are situated laterally (fig. 1).

The collum segment is large and a longitudinal furrow runs along each of its lateral edges, which are slightly curved. Above this longitudinal furrow and parallel to it near the posterior border on each side two very much shorter grooves sometimes occur. These shorter furrows appear to correspond to the longitudinal grooves of other segments.

In *Julus nitidus* the foramina repugnatoria are small and situated on the posterior border of the metazonite, and so lie in close proximity to the sutures between the segments (fig. 2, f).

The tergite of the anal segment is produced into a long caudal horn which tapers gradually and is bluntly pointed at the tip; it is round in transverse section.

### (c) Appendages.

We take the three males collected in 1915 as examples:—

A ♂ of 20 mm. had 56 segments, 101 pairs of legs, and 2 legless terminal segments.						
A ♂ of 14	do.	46	do.	77	do.	4
A ♂ of 14	do.	48	do.	85	do.	2
						do.

The number of segments and, therefore, the number of pairs of legs vary considerably according to the maturity of the specimens.

The appendages of the males collected in 1915 are arranged as follows:—

Segments.	Pairs of limbs.	
1.....	1st	One pair, modified, hook-shaped.
2.....	2nd	One pair, with pads on the 4th and 5th joints and a secretory organ on the coxite.
3.....	..	Genital apertures.
4.....	3rd	One pair.
5.....	{ 4th }	Two pairs.
	{ 5th }	
6.....	{ 6th }	Two pairs.
	{ 7th }	
7.....	{ 8th }	Anterior gonopods.
	{ 9th }	Posterior gonopods.
8 and onward .	{ 10th, 11th, }	Two pairs.
	{ etc. }	
Last 2 or 4 ..	Legless.	

In the female the first and second pairs of legs are not modified, and in place of the gonopods are two pairs of walking-legs; otherwise the arrangement is the same.

(d) *Ocelli*.

Dr. Verhoeff dwells upon the great interest of the ocelli in this species, and states that this character provides an intermediate condition between *Ommatoiulus* and *Aliuiulus*. The external surface of the field of the eye is not broken up by the convexities of the individual ocelli, and with some illuminations the microscope reveals the fact that the field is quite smooth. With some illuminations it is impossible to see the individual ocelli, with others they are quite distinctly visible.

Ocelli arrangement (1915 material) :—

In a ♂ of 14 mm. : 4, 5, 6, 5, 3, 2 (25). In curved rows, somewhat irregular.

In a ♂ of 20 mm. : 3, 5, 6, 6, 4, 4, 2, 1 (31). Irregular.

In a ♂ of 14 mm. : 3, 4, 6, 5, 4, 1 (23). Irregular.

In an immature specimen : 5, 4, 3, 2, 1 (15). Fairly regular.  
do. do. : 4, 3, 2, 1 (10). do.

It will be seen that there is great variation in the number of individual ocelli. This is also noticed in Dr. Verhoeff's description, where he records from 26–40 ocelli in different specimens. As in the case of the walking-legs, the greater number appear to occur in the more mature specimens.

Fig. 4.

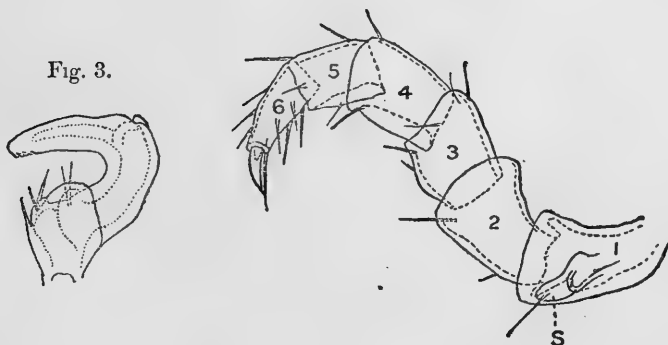


Fig. 3.—First leg of male of *C. nitidus*.  $\times 140$ . H. K. B. del.

Fig. 4.—Second leg of male, with segments numbered. s, secretory organ (penis).  $\times 140$ . H. K. B. del.

### 3. MODIFIED APPENDAGES OF THE MALE.

The first pair of legs are hook-shaped, forming an angle at the outer bend as the tip turns inwards, and a small prominence is present at this angle (fig. 3). The second pair

of legs are also slightly modified, the joints being thicker than those of the normal walking-legs, and pads are present on the fourth and fifth joints—that is, the penultimate and antepenultimate joints (fig. 4). The claws are strong, and the last joints are armed with strong bristle-like spines, some of which overlap the claws. The coxite bears a secretory organ (fig. 4, *s*). The copulatory feet or gonopods are composed of the modified appendages (two pairs) of the seventh body-segment. Their situation is denoted by a gap, as these legs are retracted, in this group, within the somite to

Fig. 5.

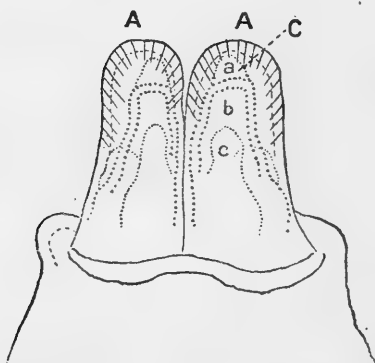
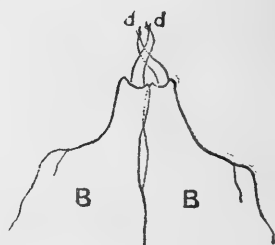


Fig. 6.



Figs. 5-8.—Gonopods. A, anterior gonopod; B, posterior portion of posterior gonopod; C, anterior branch of posterior gonopod; *a*, *b*, *c*, parts of C; F, flagellum; *d*, hooked part of B; L-L, point of measurement (see text).

Fig. 5.—Silhouette of anterior gonopods, anterior surface.  $\times 140$ .  
H. K. B. del.

Fig. 6.—Silhouette of posterior gonopods, posterior surface.  $\times 140$ .  
H. K. B. del.

which they belong. They are complicated in character, and the anterior and posterior gonopods of each side are firmly attached to one another. The anterior pair of gonopods are seen from an anterior position as two lobe-like projections rounded at the tip (fig. 5). From a posterior position the posterior pair appear as two pointed projections with the tips turned inwards, broader at the base than at the tips (fig. 6). Viewed from the side the external surfaces of the anterior and posterior gonopods are seen (fig. 7). They are clearly separated at the free ends and united at the bases. The anterior gonopods are stronger and generally less transparent than the posterior pair, which is delicate and very transparent, some parts being irregular in outline.

The anterior gonopods are leaf-like in form, and, being convex posteriorly, their lateral edges wrap round and protect the anterior branch of the posterior gonopods somewhat (fig. 7).

The posterior gonopods consist of a foliaceous anterior branch and a subtrapezoidal posterior portion.

The anterior branch consists of three parts—*a*, *b*, and *c*—which are very distinct and characteristic; *a* is finger-shaped and is the longest, standing out well beyond the others; the middle portion, *b*, is the strongest, and is protected by very

Fig. 7.



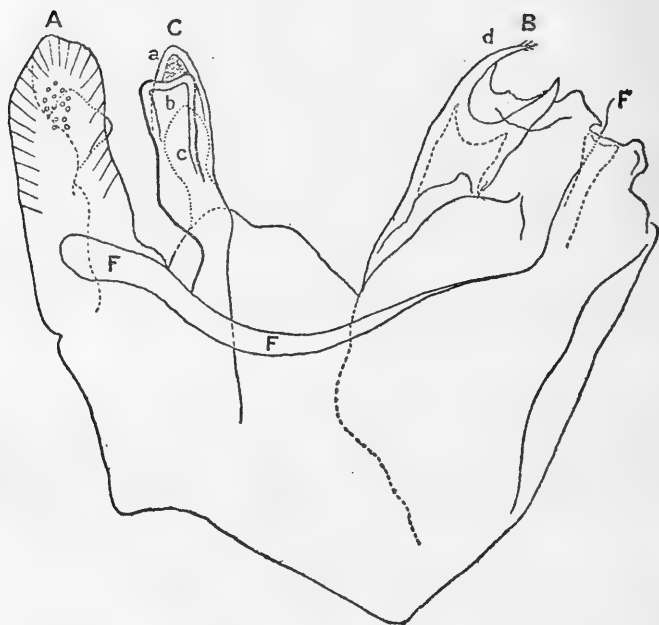
Anterior and posterior gonopods, external profile.  $\times 140$ . H. K. B. del.

thick chitin; while *c* is smaller and approaches in shape more nearly to *a*.

The structure of the posterior gonopod is clearly seen in fig. 8, which represents the inner view of the gonopods both anterior and posterior of one side. In this case the appendages have been flattened out somewhat to show the separate parts of each. The most prominent part of the posterior portion of the posterior gonopod is the hooked piece, *d*, which is sparsely plumous at the tip, while a noticeable feature is the flagellum, *F*. This, which is inserted upon the base of the anterior

gonopod, curves round so that its tip appears in repose above the delicate part of the posterior gonopod behind the hooked portion *d*. The actual breadth of the posterior gonopods at L-L in the specimen figured is 0.210 mm.\*, and that of the whole organ (anterior and posterior gonopods of one side together) is .4 mm.

Fig. 8.



Anterior and posterior gonopods, internal profile.  $\times 140$ . H. K. B. del.

We are deeply indebted to Monsieur le Docteur Henry W. Brölemann for his very careful examination and report upon our material. Drawings of the gonopods which he furnished have been invaluable in the preparation of the illustrations which accompany this paper.

We must also express our best thanks to Miss Simpson, of Darwen, for her assistance in translation.

The Victoria University of Manchester.

\* Dr. Brölemann's measurement.



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# THE ANNALS

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[EIGHTH SERIES.]

No. 114. JUNE 1917.



**XL.**—*Notes on Collembola.*—Part 4. *The Classification of the Collembola; with a List of Genera known to occur in the British Isles.* By JOHN W. SHOEBOOTHAM, N.D.A., Berkhamsted, Herts.

IN my paper on "Some Irish Collembola" (1914), p. 59, I remarked that the classification adopted was one which, in the main, had been accepted by authors for the previous seven years, and that Dr. Börner had recently proposed a new system on which I should make some notes.

This paper was practically completed during the early part of 1914, but my unexpected call to South Africa prevented me publishing it, and I then intended waiting till I returned to England. However, as I am about to publish a preliminary account of the Collembola of Lancashire and Cheshire, I feel it is just as well to list them according to the new system, which is much to be preferred to any yet proposed. I therefore give here a translation of part of Börner's paper (1913 *b*), pp. 318–322, which forms a key to the new classification, and I append a list of the genera of Collembola hitherto found in the British Isles.

My best thanks are due to Dr. A. D. Imms, of the University of Manchester, for kindly seeing this paper through the press and for criticisms and suggestions, and to Mr. T. A. Coward, also of Manchester University, for much kind assistance.

There have been many different arrangements of the Collembola made during the last 75 years, and the number of families recognized has varied from 3 to as many as 8.

Nicolet (1842) has the springtails divided into the *Smynthurelles*, *Podurelles*, and *Lipurelles*, and Lubbock (1862) called these *Smynthuridæ*, *Poduridæ*, and *Lipuridæ*, while in his monograph (1873) he formed 6 families, viz., *Smynthuridæ*, *Papiriidæ*, *Degeeriadæ*, *Poduridæ*, *Lipuridæ*, and *Anouridæ*. Various modifications were used by authors till the end of the 19th century, when another family—*Neelidæ*—was made for the reception of the genus *Neelus* of Folsom. Schäffer (1896), in his paper on "The Collembola from the Neighbourhood of Hamburg," differentiated the subfamilies *Isotominæ* and *Tomocerinæ*, which now rank as separate families.

During the present century the work of Börner has done much to advance our knowledge of the classification of the order Collembola. In one of his earliest papers (1901 *a*) he divided the Collembola into two suborders, the linear kinds to be grouped under the name *Arthropleona* and the globular forms he called *Symphypleona*. Keys were given to the families and subfamilies of the *Arthropleona*, and these, together with an account of the *Symphypleona*, were given in more detail in his paper on "The Apterygotal Fauna of Bremen" (1901 *b*). Then, in 1906, in his work on "The Classification of the Collembola," Börner discussed the whole group and the relationship of the families, subfamilies, and tribes. He recognized the families *Poduridæ*, *Entomobryidæ*, *Neelidæ*, and *Sminthuridæ*, and gave a synopsis of the subfamilies and tribes. This system, with but little variation, was used by authors for many years. Then, in 1913, when examining some species of *Pseudosira* and *Paronella* from Java, Börner happened to find a peculiar structure on the hinder trochanters, in the form of a number of short, outstanding, pointed bristles, to which he gave the name "Trochanteral organ." On looking through his collection of slides, he found that this structure was present in all the true *Entomobryinæ*, but absent in the *Tomocerinæ* and *Isotominæ*. This discovery led Börner to propose a new arrangement of families, which I give in this paper. He firstly divided the *Arthropleona* into two natural sections according to the structure of the prothorax (see below, in Key to Families, etc.). The old family *Poduridæ*, which corresponds to the new section *Poduromorpha*, was divided into three, the subfamilies *Hypogastrurinæ* and *Onychiurinæ* being raised to the family rank, and the name *Poduridæ*

restricted for the single genus *Podura*. The second section *Entomobryomorpha*, which corresponds to the old *Entomobryidæ*, was also split into three; the name *Entomobryidæ* was retained for those species possessing the Trochanteral organ, and the rest divided into two new families, *Isotomidæ* and *Tomoceridæ*. The *Sminthuridæ* and *Neelidæ* remained as before.

This classification gives us 8 families, and it may seem a large number for so small an order, but there are many districts in the world that have never been searched for springtails, and others in only a haphazard manner, and, doubtless, when the group has been more thoroughly worked, there will be hundreds of new species discovered, which will result in the formation of new genera, and probably of the larger divisions also.

As an example of how a tribe has increased in size and importance in recent years, take the *Cyphoderini*. This tribe for many years contained only the one genus *Cyphoderus*, Nicolet (1842), and that genus, as we know it to-day, contained only two or three species up to the end of the 19th century. Now, as a result of collections made in various parts of the world, there are the additional genera, *Cyphoderodes* of Silvestri (1911), *Pseudocyphoderus*, Imms (1912), the peculiar genus *Calobatella* described by Börner (1913 a). The genus *Cyphoderus* now contains a dozen or more species, with the probability of the number being increased in the near future.

*Synopsis of Suborders, Sections, Families, Subfamilies, and Tribes of the Order Collembola, taken from Börner (1913 b), pp. 318-322.*

- A. Body flattish-cylindrical, elongated, as a rule distinctly segmented, with free thoracic and free abdominal segments; rarely the abdominal segments 5 and 6 or 4-6 are fused together.

Suborder ARTHROPLEONA, C. B., 1901.

- I. *Tergum of the prothorax similar to the terga of the other body-segments*, always, as in the case of these, *possessing some hairs*. Furcula present or absent, in the first case lying under abdominal tergum 4. Integument generally granular, mostly soft, seldom with stouter chitinated sclerites. Ventral tube always short, pocket-like, smooth-walled. Manubrium ventrally always without hairs.

Section PODUROMORPHA, C. B., 1913.

- a. *Without pseudocelli*. With or without eyes. Sensory organ of the third antennal segment only with sense-rods, without sense-cones, without outer papillæ. Fourth antennal segment without subapical sense-pit, always with retractile sense-knob.

1. *Head hypognathous*. Eyes situated near the hind edge of the head. Dentes bowed in the horizontal plane, annulated towards the end, over-reaching the ventral tube. Manubrium in form recalling that of the Symphypleona, with a special medial support-piece of the dentes.
    1. Family PODURIDÆ (C. B.), 1906.
  2. *Head obliquely prognathous*. With or without eyes; these, if present, situated in front of the middle of the head. Dentes not annulated, fairly straight, seldom reaching past the ventral tube, or the furcula more or less completely reduced. When the furcula is present the manubrium is simple in form, without the medial support-piece of the dentes.
    2. Family HYPOGASTRURIDÆ (C. B.).
      - i. Mandibles with well-developed molar plate.  
Subfamily HYPOGASTRURINÆ, C. B., 1906.
      - ii. Mandibles without true molar plate or absent.  
Subfamily ACHORUTINÆ, C. B., 1906.
        - \* Anal segment with undivided supra-anal valve. With or without furcula.  
Tribe PSEUDACHORUTINI, C. B., 1906.
        - \*\* Anal segment with double-lobed broader supra-anal valve.  
Without furcula.  
Tribe ACHORUTINI, C. B., 1906.
  - b. *With pseudocelli*. Without eyes. The sense-organ on antenna III. provided with from 2-3 sense-cones, and often at the same time with outer papillæ and protecting bristles, in addition to the sense-rods. Post-antennal organ generally well-developed. Antennal segment 4 generally with subapical sense-pit (= *Lipuridæ*, Lubbock, 1869<sup>1</sup>.)
    3. Family ONYCHIURIDÆ (Lbk., C. B.).
- II. *Tergum of the prothorax always membranous and without hairs*. Furcula generally present, and in the more recent forms of the group pushed analwards. Integument generally smooth, mostly with sclerites. Ventral tube short or elongated, sometimes with a lateral blind sac. Manubrium ventrally, generally with hairs or scales, seldom naked.
- Section ENTOMOBRYOMORPHA, C. B., 1913.
- a. *Trochanteral organ absent*. Ventral edge of the claw simple, without groove.
    1. Third and fourth abdominal terga of nearly equal length or the 4th longer, sometimes this (the 4th) fused with the 5th and 6th (without scales<sup>2</sup>). Naked or ciliated sensory setæ (= *bothriotriche*) present or absent.
      4. Family ISOTOMIDÆ (Schffr., C. B., 1896-1903.)

<sup>1</sup> This should be 1870. Lubbock's "Notes on the Thysanura—Part 4," was published in 1870, not 1869.—J. W. S.

<sup>2</sup> This is as given by Börner (1913 b); but, to include the genus *Oncopodura*, Carl & Lebed., it should now read "Scales nearly always absent, when present they are without longitudinal ribs."—J. W. S., 1914.



- i. Head obliquely prognathous. Antennæ inserted in the front half of the head. (Tracheæ absent.) Furcal segment without chitin-ridges, to which are articulated the basal sclerites of the furcula if these (the chitin-ridges) are present. Furcula seldom absent. Post-antennal organ generally present.

Subfamily ISOTOMINÆ, Schffr., 1896.  
(Including the ISOTOMURINI, C. B., 1906.)

- ii. Head hypognathous. Antennæ inserted in the middle of the head. (Head tracheæ present.) Furcal segment with two stout chitin-ridges, which serve for the articulation of the basal sclerite of the furcula.

Subfamily ACTALETINÆ, C. B., 1906.

2. Third abdominal tergum considerably longer than the fourth, all abdominal segments free. With longitudinally ribbed scales. Post-antennal organ absent. Sensory setæ present, ciliated. Furcula always present.

5. Family TOMOCERIDÆ (Schffr., 1896).

- i. Dentes annulated; mucro diminutive, without hairs. Antennal segments 3 and 4 about equally long.

Subfamily LEPIDOPHORELLINÆ (C. B., 1906.)

- ii. Dentes not annulated, 2-segmented; mucro longish, with hairs. Third antennal segment strikingly elongated (this annulated as well as the fourth).

Subfamily TOMOCERINÆ (C. B., 1906).

- b. *Trochanteral organ present* (on the trochanters of the hind legs). Ventral edge of the claws as a rule with basal groove ("split"). Hairs and scales (at least in part) ciliated. Fourth abdominal tergum as a rule considerably longer than the third. Ciliated sensory setæ always present. Furcula always present.

6. Family ENTOMOBRYIDÆ (C. B., 1906).

1. Dentes slender, annulated dorsally here and there. Mucro small. With or without scales. With or without eyes. Empodial appendage with 4 wing-corners.

Subfamily ENTOMOBRYINÆ (C. B., 1906).

- i. Antenna 4-segmented, with undivided basal segments.

Tribe ENTOMOBRYINI, C. B., 1906.

- ii. Antenna 5- or 6-segmented, with the first or first and second segments secondarily divided into two.

Tribe OHCHESSELLINI, C. B., 1906.

[Here also belongs, presumably, the *Heteromuricina* of Imms, 1912. The medial cercus described by Imms should be nothing else than a peculiarly elongated supranal valve.]

2. Dentes not annulated, not, or only a little, tapered towards the end.

- i. Dentes without dorsal ciliated scales or ciliated spines, dorsally and dorso-laterally (often completely all round) uniformly haired; if dental spines are present, then sometimes they are modified into bristles at the ends of the dentes. Empodial appendage with 4 strong wing-corners.

Mucrones plump. Coxæ strikingly short. With or without scales. The hitherto known forms with eyes and free-living. Subfamily PARONELLINÆ (C. B., 1906).

- ii. Dentes with dorsal ciliated scales or ciliated spines, these at the bases of the dentes pass over into ciliated bristles. Coxæ generally distinctly longer than the trochanters (also in *Troglopedetes*?). Empodial appendage with 3 wing-corners, or more or less reduced. Eyeless and scaled.

Subfamily CYPHODERINÆ (C. B., 1906).

- \* With one entodorsal row of ciliated spines on the dentes. Free-living in caves.

Tribe TROGLOPEDETINI, C. B., 1913.

- \*\* With a double row of ciliated scales on the dentes. Mandibles with or without molar plate. Head obliquely prognathous, or hypognathous. Claws normal or with a bladder-like terminal portion. Mostly living in association with ants or termites.

Tribe CYPHODERINI, C. B., 1913.

- B. *Body pear-shaped to almost globular, as a rule, with obsolete segmentation of the thorax and the first 4 abdominal segments; especially the abdominal terga and pleuræ not differentiated. The ano-genital segments remain mostly independent, but are occasionally fused together. Manubrium with a medial support-piece of the dentes, similar to the Poduridæ, ventrally always without hairs. Pronotum (sometimes also the metanotum) without hairs.*

Suborder SYMPHYPLEONA, C. B., 1901.

- a. *Antennæ inserted in or in front of the middle of the head, always considerably shorter than the head-diagonal, 4-segmented; head without elevated vertex. Corpus tenaculi without bristles. Coxæ elongated, also on the outer side distinctly longer than the trochanteral segment. Ano-genital segment concealed under the furcal segment (seen from above). Abdominal sensory setæ absent.*

7. Family NEELIDÆ, Folsom, 1896.

- b. *Antennæ inserted behind (over) the middle of the head, generally considerably longer than the head-diagonal, not rarely with subdivided segments. Head with distinctly elevated vertex over the neck. Corpus tenaculi (generally) with bristles. Coxæ not elongated, on the outer side considerably shorter than the inner side and than the trochanteral segment. Ano-genital segment not concealed under the furcal segment. Abdominal sensory setæ present.*

8. Family SMINTHURIDÆ, Lubbock, 1862.

1. *Ventral sac (tube) even in full-grown animals smooth-walled (seldom at the tips with small warts—after Linnaniemi). Corpus tenaculi with lateral appendage (stylus?) at the base of the rami. Integument granular. Tracheæ (always?) present.*

Subfamily SMINTHURIDINÆ, C. B., 1906

- \* Anal and genital segment fused, on each side with two (one small) sensory setæ.

Tribe SMINTHURIDINI, C. B., 1913.

- \*\* Anal and genital segment separated, sometimes the latter fused with the furcal segment. The genital segment with only one sensory seta.

Tribe KATIANNINI, C. B., 1913.

2. *Ventral sac* (tube) in full-grown animals with *warted walls*. Antennæ always distinctly bent.

- i. *Antennæ bent between the 3rd and 4th segments*, 4th segment longer than the 3rd, the latter always undivided. Furcal segment without paired dorsal papillæ. Corpus tenaculi at the base of the rami without lateral appendage. Tracheæ present (always?). Genital and anal segment not fused.

Subfamily SMINTHURINÆ, C. B., 1906.

- \* *Tibio-tarsus* at the distal end on the hind side with 2-3 (seldom with a 4th on the front side) more or less closely applied clubbed hairs, not, or only little, over-reaching the claws. With or without empodial appendage. Mucronal bristle absent. Tribe BOURLETIELLINI, C. B., 1913.

[Here also belongs the genus *Corynephoris*, Absolon (1907), which is very nearly related to *Bourlettiella*, and which only differs by the absence of the empodium and through the dorsal clavate appendage. It is doubtful also whether it possesses tracheæ; abdominal sensory setæ are, however, present in normal numbers.]

- \*\* *Tibio-tarsus* without the described clubbed hairs, having instead sometimes outstanding, finely knobbed, clavate hairs. Mucro with or without bristle.

Tribe SMINTHURINI, C. B., 1913.

- ii. *Antennæ bent between the 2nd and 3rd segments*, 4th always shorter than the 3rd. Furcal segment with one pair of dorsal papillæ. Corpus tenaculi as in I (i. e. *Smintthuridine*). Tracheæ absent (always?). Genital and anal segment fused.

Subfamily DICYRTOMINÆ, C. B., 1906.

### The Genus *SIRA*, Lubbock.

In 1870, in his "Notes on the Thysanura—Part 4," Lubbock described several *Collembola* new to the English Fauna, and one formed the type of a new genus which he called *Sira* (*Seira*). In his monograph, three years later, he described several species under *Sira*, including

*S. domestica* (Nic.).

*S. nigromaculata*, Lbk.

*S. buskii* Lbk.

In later years the genus was split up, and Schött proposed the name *Pseudosira* for types like the *S. domestica* (Nic.), leaving the name *Sira* for those like *nigromaculata* and *buskii*. But this should not be so, for Lubbock expressly states that *domestica* forms the type of his genus *Sira*. Therefore *Pseudosira* must fall and *Sira* take its place, and for the species hitherto included in *Sira*, I propose the new name *Willowsia*<sup>1</sup>.

<sup>1</sup> Named after my friend Mr. F. W. Willows, of Tsolo, South Africa.

Genus *SIRA*, Lbk., mihi.

*Seira*, Lubbock (1870), p. 279.  
= *Pseudosira*, Schött.

Dentes ventrally covered with scales.

Type. *S. domestica* (Nic.).

Genus *WILLOWSIA*, gen. nov.

Dentes ventrally only with ciliated hairs, without scales.

Type. *W. (Seira) nigromaculata* (Lbk.).

*List of Genera of Collembola found in the British Isles.*

Class **INSECTA**.

Subclass **Apterygota**, Oudns.

Order **COLLEMBOLA**, Lbk.

Suborder **ARTHROPLEONA**, C. B.

Section **PODUROMORPHA**, C. B.

I. Family **Poduridæ** (C. B.).

1. Genus *PODURA*, Linn., Tbg.

II. Family **Hypogastruridæ** (C. B.).

Subfamily **HYPOGASTRURINÆ**, C. B.

2. Genus *HYPOGASTRURA*, Bourl., C. B.

3. Genus *XENYLLA*, Tbg.

4. Genus *WILLEMIA*, C. B.

5. Genus — ?

A genus comes here related to both *Hypogastrura* and *Xenylla*. I have an English species in my collection, which in many respects is intermediate between these two genera, but so far I have not described it. Possibly it is *Beckerella*, Linnaniemi.

Subfamily **ACHORUTINÆ**, C. B.

Tribe **PSEUDACHORUTINI**, C. B.

6. Genus *PSEUDACHORUTES*, Tbg.

7. Genus *MICRANURIDA*, C. B.

8. Genus *ANURIDA*, Laboulb.

9. Genus *FRIESEA*, D. T.

10. Genus *CHONDRACHORUTES*, Wahlgr.

[The genus *Chondrachorutes* of Wahlgren has not been previously recorded from the British Isles, but it nevertheless occurs there, for I took specimens at Berkhamsted, Herts, in 1910, but have not yet described them.]

Tribe *ACHORUTINI*, C. B.

11. Genus *ACHORUTES*, Templ., C. B.

= *Neanura*, MacG.

III. Family *Onychiuridae* (Lbk., C. B.).

12. Genus *ONYCHIURUS*, Gerv., C. B.

13. Genus *PROTAPHORURA*, Absln., C. B.

14. Genus *TULLBERGIA*, Lbk.

Section *ENTOMOBRYOMORPHA*, C. B.

IV. Family *Isotomidae* (Schffr., C. B.).

Subfamily *ISOTOMINÆ*, Schffr.

15. Genus *ISOTOMA*, Bourl., C. B.

16. Genus *AGRENIA*, C. B.

17. Genus *PROISOTOMA*, C. B.

17 a. Genus ? *ARCHISOTOMA*, Linnaniemi.

[Linnaniemi has proposed the genus *Archisotoma* for the reception of *Proisotoma besselsi* (= *P. spitzbergenensis*, Lbk.), but as I have neither my specimens of *besselsi* nor Linnaniemi's description by me at the moment, I cannot say whether it should be regarded as a separate genus or as a subgenus of *Proisotoma*.]

18. Genus *ANUROPHORUS*, Nic.

19. Genus *FOLSOMIA*, Willem.

20. Genus *TETRACANTHELLA*, Schtt.

21. Genus *ISOTOMODES*, Axels-Linn.

22. Genus *ISOTOMURUS*, C. B.

23. Genus *ONCOPODURA*, Carl & Lebed.

Subfamily *ACTALETINÆ*, C. B.

[The subfamily *Actaletinæ* is not represented in the British Isles.]

V. Family **Tomoceridæ** (Schffr.).

Subfamily *LEPIDOPHORELLINÆ*, C. B.

[The subfamily *Lepidophorellinæ* is not represented in the British Isles.]

Subfamily *TOMOCERINÆ* (C. B.).

24. Genus *TOMOCERUS*, Nic.

24 a. Genus ? *POGONOGNATHUS*, C. B.

[Börner has proposed the genus *Pogonognathus* for the species *Tomocerus* (*P.*) *longicornis* Müll.)]

VI. Family **Entomobryidæ** (C. B.).

Subfamily *ENTOMOBRYINÆ* (C. B.).

Tribe *ENTOMOBRYINI*, C. B.

25. Genus *ENTOMOBRYA*, Rond.

26. Genus *SINELLA*, Brook.

27. Genus *LEPIDOCYRTUS*, Bourl.

28. Genus *SIRA*, Lbk., Sbthm.

29. Genus *WILLOWSIA*, gen. nov.

Tribe *ORCHESELLINI*, C. B.

30. Genus *ORCHESELLA*, Templ.

31. Genus *HETEROMURUS*, Wankel.

Subfamily *PARONELLINÆ*, C. B.

[The subfamily *Paronellinæ* is not found in the British Isles.]

Subfamily *CYPHODERINÆ* (C. B.).

Tribe *TROGLOPEDETINI*, C. B.

[This tribe has not yet been found in the British Isles.]

Tribe *CYPHODERINI*, C. B.

32. Genus *CYPHODERUS*, Nic.

Suborder *SYMPHYPLEONA*, C. B.

VII. Family **Neelidæ**, Flsm.

33. Genus *NEELUS*, Flsm.

34. Genus *MEGALOTHORAX*, Willein.

VIII. Family *Sminthuridæ*, Lbk.

Subfamily *SMINTHURIDINÆ*, C. B.

Tribe *SMINTHURIDINI*, C. B.

35. Genus *SMINTHURIDES*, C. B.

Tribe *KATIANNINI*, C. B.

36. Genus *SMINTHURINUS*, C. B.

37. Genus *ARRHOPALITES*, C. B.

Subfamily *SMINTHURINÆ*, C. B.

Tribe *BOURLETTIELLINI*, C. B.

38. Genus *BOURLETTIELLA*, Banks, C. B.

Tribe *SMINTHURINI*, C. B.

39. Genus *SMINTHURUS*, Latr., C. B.

40. Genus *ALLACMA*, C. B.

41. Genus *SPHRYOTHECA*, C. B.

Subfamily *DICYRTOMINÆ*, C. B.

42. Genus *DICYRTOMA*, Bourl., C. B.

43. Genus *DICYRTOMINA*, C. B.

44. Genus *PTENOTHRIX*, C. B.

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XLI.—*Notes on Fossorial Hymenoptera*.—XXVIII. *On new Ethiopian Species of Bembex in the British Museum*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

*Bembex obtusa*, sp. n.

♂. Niger; mandibulis, apice excepto, labro, clypeo, fronte macula obliqua nigra utrinque, scapo, orbitis externis, pronoto margine postico, callis humeralibus, prosterno, mesosterno antice, mesonoto linea supra tegulas, scutello linea obliqua utrinque, postscutello margine postico, pedibusque flavis; femoribus anticis supra nigro-lineatis, tarsis anticis infra nigro-maculatis; segmento dorsali primo macula transversa utrinque fasciaque transversa mediana angustissima, segmentis dorsalibus 2-6 fascia transversa bisinuata, ventralibus 2-5 macula utrinque, segmento ventrali primo fascia angusta apicali flavo-olivaceis; flagello subtus ochraceo; segmento dorsali sexto apice, septimoque dimidio basali ferrugineis; alis hyalinis, venis fuscis, thorace duplo longioribus.

Long. 21 mm.

♂. Clypeus very broadly triangularly flattened on the apical half, labrum flattened at the base; a strong longitudinal carina between the antennæ; sixth, seventh, and eighth joints of the flagellum each with two or three small spines beneath,



joints 9 and 10 subdenticulate beneath, penultimate joint concave beneath, longer than the tenth, apical joint about half as long again as the penultimate, concave beneath, blunt and rather strongly curved at the apex. Fore tarsi rather stout, with a strong tarsal comb, the apical joint flattened, nearly as broad and less than half as long again as the penultimate, with a small spine on the middle of the outer margin; anterior and intermediate femora not serrate; intermediate tibiae produced into a distinct spine at the apex. Seventh dorsal segment very broad, with parallel sides on the basal portion to beyond the middle, the apex obtuse; the surface of the segment finely punctured, with coarse punctures intermixed near the apex. Second ventral segment with a very large tubercle, which is broadly truncate at the apex; sixth ventral segment with a slightly raised, broadly triangular area near the apex; seventh broad, with a longitudinal carina on each side; eighth produced into a stout blunt tooth. Median cell of the hind wing emitting only one vein from the apex.

*Hab.* Nyasaland, Mlanje, 2300 ft. (*S. A. Neave*), October.

The apical dorsal segment is shaped somewhat as in the variety of *B. pugillatrix* figured by Handlirsch (*Sitzungsb. Akad. Wiss. Wien*, cii. t. v. fig. 15), but the parallel sides are continued much nearer to the apex than in that figure. In the antennæ it approaches *albofasciata*, Sm. (= *karschii*, Handl.), also in the short wings, but differs in the legs and apical abdominal segments. The three intermediate joints of the fore tarsi are moderately dilated, about as broad as long, nearly as much dilated as in *latitarsis*, Handl.

*Bembex johnstoni*, Turn.

*Bembex johnstoni*, Turn. *Ann. & Mag. Nat. Hist.* (8) x. p. 372 (1912).  
♂.

This belongs to the group of *B. diversipennis*, not of *möbii*, to which I compared it in the description; it is, indeed, probably only an extreme colour-variation of *diversipennis*. In a considerable series of that species from E. Africa the thorax is always without yellow markings in both sexes, except in one female from Harar. The yellow markings on the abdomen vary much, but do not form continuous fasciæ as in most West-African specimens. The wings are hyaline in the male, more or less strongly fuscous at the base in the female in all specimens which I have seen.

*Bembex albidula*, sp. n.

♂. Niger; abdomine cæruleo-tincto; mandibulis, apice excepto, labro, clypeo macula magna basali nigra utrinque, scapo subtus, orbitis, macula parva utrinque sub ocellis, prosterno, callis humeralibus apice, segmento mediano angulis posticis, segmentis dorsalibus 2-4 fascia late interrupta, primo macula magna utrinque, quinto fascia anguste interrupta, sexto linea transversa utrinque, segmentis ventralibus secundo tertioque macula parva utrinque, femoribus anticis intermediisque subtus, tibiis supra nigro-lineatis, tarsisque anticis intus albidis; alis hyalinis, venis fuscis, anticæ latitudine thoracis duplo et dimidium longiores.

Long. 22 mm.

♂. Eyes distinctly divergent towards the clypeus; labrum flattened, clypeus convex; carina between the antennæ very low. Antennæ almost normal; eighth joint of the flagellum with two very minute spines beneath; ninth with a minute spine near the base; apical joint slightly curved, rounded at the apex, longer than the penultimate. Fore tarsi moderately stout, the joints not dilated; the basal joint with seven spines, the basal spine small. Fore and intermediate femora unarmed, intermediate tarsi simple, intermediate tibiæ not produced at the apex and without a long apical spur. Seventh dorsal segment subtriangular, narrowly rounded at the apex, closely punctured at the base, sparsely at the apex. Second ventral segment with a small tubercle near the apex; sixth produced into a stout blunt tooth at the apex; seventh unarmed, without carinæ; eighth in the form of an acute spine. Median cell of the hind wing emitting two veins from the apex.

*Hab.* Sierra Leone, Mussaia (*J. J. Simpson*), April.

This fine species is somewhat intermediate between *diversipennis* and *monedula*, but seems to belong to the group of the latter, though distinguished from it by the spines on the eighth and ninth joints of the flagellum, and by the much narrower seventh dorsal segment. Handlirsch, in giving the distinguishing characters of the group, says "Mittelschenkel gezähnt," but in describing the species says "femoribus intermediis infra non dentatis." The latter statement is correct.

*B. ugandensis*, Turn., is also near this species, but differs in the structure of the antennæ, the hollow grooves beneath the three apical joints being well marked in *ugandensis* and almost obsolete in the present species, the spines on the other joints are also different. The colour-differences, though great and apparently constant locally, cannot alone be relied on in this group.

*Bembex odontopyga*, sp. n.

♂. Niger; mandibulis, apice excepto, labro, clypeo macula basali nigra utrinque, scapo subtus, orbitis, femoribus, tibiisque subtus, tarsisque flavis; flagello subtus obscure brunneo; segmentis dorsalibus 2-4 fascia angusta late interrupta, quinto sextoque fascia continua, septimo macula obliqua utrinque, segmentisque ventralibus 2-5 fascia angusta continua apicali brunneo-flavis; segmentis dorsalibus obscure cæruleo-micantibus; segmento septimo dorsali apice fusco-ferrugineo; alis hyalinis, venis fuscis. Long. 19 mm.

♂. Clypeus with a carina from the base to beyond the middle, deflexed from the end of the carina to the apex, not very strongly convex; the carina between the antennæ very distinct. Four apical antennal joints distinctly hollowed beneath, stout, the apical joint blunt at the apex, a little longer than the penultimate. Head, thorax, and median segment clothed with long whitish pubescence, that on the mesonotum shorter and brownish. Fore tarsi normal, the basal joint with seven spines; fore and intermediate femora not serrate. Median segment with a very feeble longitudinal groove. Seventh dorsal segment with a short spine on each side near the base, the apex rather broadly truncate, not undulating at the sides. Ventral segments unarmed. Wings about two and a half times as long as the breadth of the thorax; median cell of the hind wing emitting two veins from the apex. The eyes are distinctly divergent towards the clypeus.

*Hab.* Nyasaland, Ngara (*Dr. J. E. S. Old*), October.

This belongs to the *bidentata* group, and apart from colour-differences may be distinguished from *möbii* by the absence of a strong tooth at the apex of the intermediate femora; from *bidentata* by the more distinct carina of the clypeus, by the colour of the pubescence, and by the broader apex and less developed teeth of the seventh dorsal segment. *B. scotti*, Turn., the only remaining African species of the group, may be at once distinguished from this by the much finer and sparser puncturation of the thorax and median segment. In colour *odontopyga* resembles *compedita*, Turn., which is allied to *fuscipennis*.

*Bembex forcipata*, Handl.

*Bembex forcipata*, Handl. Sitzungsab. Akad. Wiss. Wien, cii. p. 798 (1893). ♂.

*Bembex massaica*, Cameron, Sjöstedt, Kilimandjaro-Meru Exp. ii. p. 290 (1910). ♂.

*Bembex liturata*, sp. n.

- ♂. Niger; labro albido, basi macula longitudinali brunnea; mandibulis, apice excepto, clypeo fascia transversa basali nigra, scapo subtus, orbitis, pronoto margine postico, propleuris callis humeralibus, mesosterno antice, tegulis macula, linea supra tegulas, scutello margine postico, pedibusque flavis; tibiis supra nigro-lineatis; segmentis dorsalibus sex basalibus fascia flavo-olivacea; segmentis ventralibus primo apice, secundo fascia lata transversa, 3-6 macula utrinque flavis; alis hyalinis, venis fusco-ferrugineis.
- ♀. Mari similis, clypeo dimidio basali nigro; segmento mediano macula parva utrinque flavo; segmento ventrali secundo dimidio apicali brunneo-ferrugineo, utrinque flavo-maculato.
- Long., ♂ 17, ♀ 15 mm.

♂. Clypeus strongly convex; inner margin of the eyes almost parallel; no carina between the antennæ; seventh joint of the flagellum emarginate at the apex beneath, eighth with a small spine beneath, ninth and tenth stout, penultimate joint much broadened, longer than the subconical apical joint. Tarsi slender, the spines of the comb of the anterior tarsi slender; intermediate femora very feebly serrate. Seventh dorsal segment very broadly rounded or subtruncate at the apex, with a marginal carina on each side near the base. Second ventral segment with a strong tubercle, which is rounded at the apex; sixth with a large raised semicircular area. Wings rather short, only twice as long as the breadth of the thorax; median cell of the hind wing emitting only one vein from the apex.

♀. Basal joint of the fore tarsus with seven spines; sixth dorsal segment broadly triangular, very sparsely punctured in the middle, more coarsely and closely on the sides; second ventral segment shining in the middle, with large sparse punctures.

*Hab.* S. Africa, Willowmore (*Dr. H. Brauns*), December.

The male genitalia are not strongly curved as in the *melanopa* group, the relationship being rather with the *mediterranea* group.

*Bembex opima*, sp. n.

- ♂. Niger, clypeo, mandibulis, apice excepto, labroque albo-flavibus; flagello subtus brunneo-ferrugineo; scapo, supra nigro maculato, orbitis, pronoto postice, callis humeralibus, tegulis, mesonoto linea supra tegulas, scutello margine postico, postscutello margine postico, segmento mediano fascia angusta apicali, segmento dorsali primo dimidio apicali, secundo antice nigro bisinuato, 3-6 omnino, segmentis ventralibus 2-5 lateribus et

margine apicali, pedibusque flavis; alis hyalinis, venis fusco-ferrugineis.

♀. Mari similis; macula flava sub ocellis, segmento dorsali secundo flavo, macula parva nigra utrinque, 3-5 basi anguste nigris, sexto nigro macula flava apicali utrinque; alæ anticæ thoracis latitudine duplo et dimidium longiores.

Long., ♂ ♀, 16 mm.

♂. Clypeus strongly convex, labrum flattened, no carina between the antennæ; seventh, eighth, and ninth joints of the flagellum spined beneath, apical joint curved, truncate at the apex, no longer than the penultimate. Anterior femora unarmed, intermediate femora very obscurely serrate; anterior tarsi normal, the basal joint with six spines; intermediate tibiæ and tarsi normal. Second ventral segment with a strong tubercle acute at the apex; sixth ventral segment with a slightly raised triangular area; seventh dorsal segment closely punctured, narrowly rounded at the apex, the sides with short, stiff, black pubescence. Median cell of the hind wing emitting two veins from the apex, the lower vein ill-defined. Head and thorax thickly clothed with grey pubescence.

♀. Middle of the second ventral segment shining, with deep sparse punctures; sixth dorsal segment subtriangular, very narrowly rounded at the apex, closely punctured, with stiff setæ on the sides, subcarinate longitudinally in the middle.

*Hab.* S. Africa, Willowmore (*Dr. H. Brauns*), January and February.

The seventh ventral segment of the male has a median longitudinal carina.

This seems to be nearest to *capicola*, Handl., though differing in the armature of the ventral segments of the male, the shape and sculpture of the seventh dorsal segment, and in other smaller details.

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XLII.—*On Fabricius's Types of Odonata in the British Museum (Natural History).* By HERBERT CAMPION.

As far as I am able to ascertain, the British Museum Collections include fourteen Dragonflies which have been described or determined by Fabricius. All but two of them came in Sir Joseph Banks's Collection of insects, which was presented by the Linnean Society in 1863. Although the welfare of

the collection necessitated its removal from the large and ornate cabinet in which it was then contained, it has fortunately remained intact and separate from the main collections of the Museum.

With regard to the identification-labels relating to these historical specimens, an attempt has been made to determine, by the character of the handwriting itself, whether Fabricius was the author of all or any of them. Through the good offices of Mr. J. H. Durrant I have been able to examine the caligraphy of two holograph letters written by Fabricius in Paris in 1805. Although both were produced in the same year, there is a considerable difference between them in style and even in the formation of letters—a fact which makes it all the more difficult to distinguish Fabricius's hand from other writing of the same period. At the same time, these labels are in two different styles of writing, at least, and the two styles may even be detected upon the same label. Nevertheless, I think it may be assumed that most, if not all, of the drawer-labels in the Banks Collection are the work of Fabricius himself. The case of the pin-labels in the General Collection is much clearer, as they correspond exactly, both in form and caligraphy, with the labels attached to certain undoubted Fabrician types of Coleoptera to which Dr. C. J. Gahan has kindly called my attention.

#### I. SPECIMENS IN THE BANKS COLLECTION.

The twelve Banksian dragonflies, which nominally represent as many species, are in a fair state of preservation, and, with the exception of those labelled *Libellula carolina*, *Æshna grandis*, *Agrion virgo*, and *A. linearis*, are the types of species described by Fabricius at various dates. Five of these are the types of nominal species merely, the valid species represented by their types being *Libellula* [*Neurothemis*] *stigmatizans*, *L.* [*Rhyothemis*] *notata*, and *Agrion* [*Sapho*] *ciliata*. Certain other types referred to by Fabricius as being in the Banksian Collection are not now to be found there, and I am unable to learn anything concerning their fate. The missing insects are *Libellula bifasciata* (= ? *Libellula lydia*, Drury, ♀), *L. variegata* (= *Palpopleura lucia*, Drury, ♀), and *Æshna variegata*. As regards the last-named, the British Museum register of accessions expressly mentions *Æshna variegata*, from Tierra del Fuego, as being in the Banksian Collection at the time of its acquisition by the Museum (1863). In 1887 McLachlan knew of its disappearance, and wrote, "In order to save disappointment,

I state that it no longer exists in Mus. Banks, and has probably been long ago destroyed" (Ent. Mo. Mag. xxiv. p. 77). It is unlikely now that the obscurity which surrounds the identity of this species, as well as the history of the type, will ever be cleared up.

No fewer than five of the specimens under consideration have obviously incorrect habitats assigned to them in Fabricius's writings. These are *Libellula equestris* (= *Neurothemis tullia*, Drury), *L. ferruginata* (= *Crocothemis servilia*, Drury), *Æshna grandis* (= *Æschna cyanea*, Müll.), *Agrion ciliata* (= *Sapho ciliata*, F.), and *A. linearis* (= *Mecistogaster linearis*, F.). Of course, lapses of this description were not at all infrequent at a time when little or no importance was attached to the facts of geographical distribution.

Below each insect stands a large oblong drawer-label, with a double black border, bearing the name of the genus and species, as well as a reference to the published description. The labels applying to *Libellula stigmatizans*, *L. oculata*, and *L. carolina* have a portion of the reference printed in—i. e., "Fab. Entom. p." in the case of the two first-named, and "Linn. S. N. p." in the case of the last-named. The only pin-labels of any description are four tickets marked with the British Museum registration number, and five modern-looking tickets bearing the name of the reputed country of origin. Three manuscript genus-labels, dividing the collection into the genera *Libellula*, *Æshna*, and *Agrion*, may also be of post-Fabrician date.

In considering the specimens *seriatim*, Fabricius's original diagnosis of each of the eight types may be usefully quoted, but for our present purposes his more detailed descriptions need not be consulted, and will therefore be omitted.

- (1) *Libellula stigmatizans*, F. ♀. Type.  
(= *Neurothemis stigmatizans*, F., ♀.)

*Labels*:—"Libellula stigmatizans Fab. Entom. p. 421, n. 5"; square white ticket, "Australia," printed; round blue ticket, "<sup>63</sup><sub>47</sub>."

*Diagnosis*:—"L. flavescens, alis macula apiceque fuscis: stigmatibus niveo. Habitat in nova Hollandia. Mus. Bankianum."—F., Syst. Ent. p. 421, no. 5 (1775).

This specimen and the next were examined by De Selys, and were identified by him as the ♀ and ♂ respectively of a single species (Ann. Mus. Civ. Genova, xiv. pp. 292, 293; 1879). Although he adopted the name of the ♂ (*oculata*) as that of the species, the modern rule respecting page-

precedence requires the application to the species of the first name written by Fabricius (*stigmatizans*).

- (2) *Libellula oculata*, F. ♂, juv. Type.  
(= *Neurothemis stigmatizans*, F., ♂.)

*Labels*:—" *Libellula oculata* Fab. Entom. p. 421, n. 6"; square white ticket, "Australia," printed; round blue ticket, "63"  
47"

*Diagnosis*:—" *L. flavescens*, alis anticis apice, posticis margine aqueis: stigmatate niveo. Habitat in nova Hollandia. *Mus. Bankianum*."—F., Syst. Ent. p. 421, no. 6 (1775).

Fabricius's additional words, "Præcedenti [*L. stigmatizans*] nimis affinis, cujus forte mera varietas," are worthy of note.

See also the remarks under (1) *L. stigmatizans*, above.

- (3) *Libellula indica*, F. ♀. Type.  
(= *Rhyothemis variegata*, Linn.)

*Label*:—" *Libellula indica* Fabr. Sp. Ins. No. 8."

*Diagnosis*:—" *L. alis flavo fuscoque variis apice albis, posticis macula baseos cyanea. Libellula Arria. Drury Ins.* 2. tab. 46. fig. 1. Habitat in Coromandel. *Mus. Dom. Banks*."—F., Spec. Ins. i. p. 521, no. 8 (1781).

The most noticeable difference between *Rhyothemis variegata variegata* and *Rh. variegata arria*, the Indian and Chinese forms of this variable species, is one of size, and in this respect our type undoubtedly belongs to the smaller Indian form, the abdomen measuring 20.5 mm. and the hind wing 30.5 mm.

- (4) *Libellula notata*, F. Type.  
(= *Rhyothemis notata*, F.)

*Labels*:—" *Libellula notata* Fabr. Mss. Ins. n. 19"; oblong white ticket, "Sierra Leone," written.

*Diagnosis*:—" *L. alis planis nigris: maculis apiceque albis. Habitat in Sierra Leon Africæ Mus. Dom. Banks*."—F., Mant. Ins. i. p. 337, no. 19 (1787).

This type is a normal specimen of the West-African species figured and described by Ris as the true *notata* of Fabricius (Coll. Selys, Libell., fasc. xv. p. 959, pl. vii.; 1913). The abdomen is missing, and the sex has not been definitely determined, although the wing-pattern rather indicates a male. The hind wing measures 26 mm.



(5) *Libellula equestris*, F. ♂. Type.  
(= *Neurothemis tullia*, Drury.)

*Labels*:—"Libellula equestris Fabr. Sp. Ins. No. 20"; square white ticket, "Africa," written.

*Diagnosis*:—"L. alis dimidiato nigris, fascia media nivea. Habitat in Africa æquinoctiali. *Mus. Dom. Banks.*"—F., Spec. Ins. i. p. 523, no. 20 (1781).

This insect agrees very well with Drury's figure of his *Libellula tullia*, adult ♂, from Bombay (Ill. Ex. Ent. ii. pl. xlv. fig. 3; 1773). That figure, however, fails to show the transverse white band in the wings, and is also a little larger than Fabricius's type, the hind wing measuring 22 mm., as compared with 21 mm. In our type the last antenodal is continuous in both fore wings. The reference to Africa is, of course, a mistake, as the genus *Neurothemis* is entirely unknown from that continent.

(6) *Libellula marginata*, F. ♂. Type.  
(= *Palpopleura lucia*, Drury.)

*Labels*:—"Libellula marginata Fabr. Sp. Ins. No. 24"; square white ticket, "Africa," written; round blue ticket, "63"  
47

*Diagnosis*:—"L. alis nigris, anticis macula apicis, posticis margine albis. Habitat in Africa æquinoctiali. *Mus. Dom. Banks.*"—F., Spec. Ins. i. p. 523, no. 24 (1781).

Comparing this specimen with the plate of coloured figures of *Palpopleura lucia* in Ris's monograph of the Libellulinæ (Coll. Selys, Libell., fasc. ix. pl. i.), we find that the pattern of the fore wing is intermediate between the first and second of those figures, while that of the hind wing is something between the second and third figures.

(7) *Libellula ferruginata*, F. ♂. Type.  
(= *Crocothemis servilia*, Drury.)

*Label*:—"Libellula ferruginata Fabr. Sp. Ins. No. 11." The specific name was written originally "ferruginea," and was altered subsequently to "ferruginata."

*Diagnosis*:—"L. alis basi flavescentibus, corpore obscure ferrugineo. Habitat ad Cap. Bon. Spei. *Mus. Dom. Banks.*"—F., Spec. Ins. i. p. 521, no. 11 (1781).

*L. ferruginata*, F., has been erroneously identified with the common African species *Crocothemis erythræa*, Brullé, because the Cape of Good Hope was stated to be its habitat. This

locality, however, is manifestly a wrong one, as *Fabricius's* type clearly belongs to the Asiatic form *Crocothemis servilia*, Drury, 1773. This is shown by the abdomen, which is parallel-sided and devoid of mid-dorsal black spots, and by the wings, which are narrow and rather smoky at the tips. The abdomen measures 27.5 mm. and the hind wing 34 mm. There are  $11\frac{1}{2}$  antenodal's in each fore wing. Drury's figure of *Libellula servilia*, from China (Ill. Ex. Ent. i. pl. xlvii. fig. 6; 1770), agrees fairly well with the type of *L. ferruginata*, the main points of difference being that the abdomen is too long and that the coloured area at the base of the fore wings is too large. In 1793 (Ent. Syst. ii. p. 380) *Fabricius* treated his *L. ferruginata*, as well as *L. servilia*, Drury, as synonyms of his *L. ferruginea*. In the original description of *L. ferruginea*, 1775, the habitat was given as "America," but in 1793 the habitat was changed to "China."

(8) *Libellula carolina*, Linn. ♂.  
(= *Tramea virginia*, Ramb.)

*Label* :—" *Libellula carolina* Linn. S. N. p. 504. n. 17."

The base of the abdomen is in poor condition, the contents having apparently been eaten out by mites, and the hamules have disappeared. Nevertheless, the character of the basal spot in the hind wing is sufficient to show that the insect is not the North-American *Tramea carolina*, Linn., but the Chinese species now known as *Tramea virginia*, Ramb. This Chinese species is usually referred to as *Tramea chinensis*, De Geer, but, as a case of homonymy is involved, Dr. Ris (Coll. Selys, Libell. fasc. xvi. (1) p. 978; 1913) has recently restored to it Rambur's name of *virginia*. Re-examination of Rambur's type has revealed its Asiatic origin, notwithstanding that author's erroneous citation of its habitat as "Amérique septentrionale" (Ins. Névr. p. 34; 1842).

(9) *Æshna grandis*, Linn. ♂.  
(= *Æschna cyanea*, Müll.)

*Label* :—" *Æshna Grandis* Fabr. Sp. Ins. No. 2."

*Reference* :—" *A. thorace lineis quatuor flavis, corpore variegato. Habitat et in Insulis Sandwichii Mus. Dom. Banks.*"—F., Mant. Ins. i. p. 339, no. 2 (1787).

In this passage, which is quoted *in extenso*, *Fabricius* proposes to extend the distribution of *Æ. grandis*, as given in his earlier writings, so as to include the Sandwich Islands. The locality is not repeated in *Fabricius's* list of 1793, and

is, of course, entirely erroneous. The insect is, in fact, a ♂ of the common European species *Æschna cyanea*, Müll., which was not recognized as a distinct species until 1764. It seems to have been confused by many of the older entomologists with *Æ. juncea*, Linn., or even, as in the present case, with *Æ. grandis*, Linn.

(10) *Agrion ciliata*, F. ♀. Type.  
(= *Sapho ciliata*, F.)

*Labels*:—"Agrion ciliata Fabr. Sp. Ins. No. 3"; round blue ticket, "<sup>63</sup><sub>47</sub>"

*Diagnosis*:—"A. viridi ænea, abdomine fusco, pedibus ciliatis nigris. Habitat in Coromandel. *Mus. Dom. Banks.*"—F., Spec. Ins. i. p. 528, no. 3 (1781).

Concerning this specimen De Selys wrote thus:—"J'ai reconnu notre espèce dans l'exemplaire type de l'*Agrion ciliatus* mâle, de Fabricius, qui existe encore heureusement dans la collection de Joseph Bancks, déposée à la Société Linnéenne de Londres. Dans ses ouvrages, Fabricius indique par erreur *Coromandel* comme la patrie du *ciliatus*, mais j'ai examiné avec soin l'exemplaire type sous le rapport de la réticulation, et je me suis assuré qu'elle est en tout conforme à celle des individus de *Sierra Léone*" (Monogr. Calopt. p. 60, 1854). Fabricius's type, however, is not a male, as stated by De Selys, but a small example of the female sex. The abdomen is 41 mm. in length and the hind wing 37 mm.

(11) *Agrion virgo*, Linn. ♂.  
(= *Calopteryx splendens*, Harr.)

*Label*:—"Agrion Virgo Fabr. Sp. Ins. p. 526. n. 1."

This is the common European species *Calopteryx splendens*, Harr., which was regarded by Linnæus as merely a form of *C. virgo*. Fabricius apparently adopted the same view, and never recognized Harris's action in 1782 in separating the two forms specifically.

(12) *Agrion linearis*, F. ♂.  
(= *Mecistogaster linearis*, F.)

*Label*:—"Agrion Linearis Fabr. Sp. Ins. No. 5."

This specimen is not the type, the species having been described in 1776 from material in the possession of Dr. Fothergill. The type cannot now be traced, and in its absence it is impossible to say precisely what Fabricius's species may be.

In 1781 he identified it with *Mecistogaster lucretia*, Drury, and some colour is lent to this identification by the fact that both species were described from Fothergill's collection. Drury stated that his *lucretia* came from the Cape of Good Hope, while Fabricius gave India as the habitat of his *linearis*; but, of course, *Mecistogaster* is exclusively a Neotropical genus. Whatever may be the identity of the Fabrician type, the species in the Banks Collection is quite distinct from that figured by Drury. The specimen before us was examined by De Selys, and referred by him to the species which he described as *M. linearis*, F. (Bull. Acad. Belg. (2) x. p. 22, 1860). A note appended to that description may be usefully quoted here:—"L'exemplaire de la collection Banks à Londres, qui passe pour avoir été étiqueté par Fabricius, est un mâle de cette espèce, à ptérostigma brun (semi-adulte). Les figures de Drury et de Sulzer, citées à l'appui dans l'*Entomologia systematica*, sont au contraire la *lucretia*. Quant à la description de Fabricius, elle peut s'appliquer aux deux espèces. Si l'on devait prendre le *linearis* de Fabricius pour synonyme de *lucretia* (nom plus ancien), il faudrait adopter pour notre espèce *linearis* le nom de *tullia*, de Burmeister."

## II. SPECIMENS IN THE GENERAL COLLECTION OF THE BRITISH MUSEUM.

In 1793 (Ent. Syst. ii.) Fabricius referred to three dragonflies in the British Museum Collection. These were *Libellula trimaculata*, De Geer (= *L. lydia*, Drury), p. 374, no. 3; *L. sinuata* (= *Palpopleura lucia*, Drury), p. 378, no. 17; and *L. vibrans*, p. 380, no. 30. The first is involved in much obscurity, and the second has not been traced at all, but *L. vibrans* has been identified with certainty. Unlike the Banksian insects, the two Fabrician specimens now in the General Collection carry a plain buff pin-label, with the two upper corners cut off, and bearing the name of the species in Fabricius's handwriting.

- (1) *Libellula lata*, F. ♀.  
(= *L. lydia*, Drury, ♀.)

*Label*:—"Libellula lata Fab."

Apparently this name was never published, and the only reference to it which I can find is one contained in an interleaved and annotated copy of Linnaeus's '*Systema Naturæ*' (ed. xii.). This book is preserved in the British Museum

(Natural History), but the authorship and date of the supplementary descriptions with which it abounds are unknown to me. Several manuscript additions to the genus *Libellula* have been made, and among them is the following:—

“lata. LIB. alis planis hyalinis fascia maculaque baseos nigro-fusca, abdomine carinato glauco.  
*Mscr.\**  
 Hab. in Pensylvania, Marylandia, Carolina.”

These words, however, while agreeing sufficiently well with the male of *L. lydia*, do not apply to the Fabrician specimen, which is a female of that species.

There seems to be some reason for believing that *Libellula bifasciata*, F., usually identified with *L. pulchella*, Drury, may be, in reality, the ♀ of *L. lydia*, Drury. The last-named insect is very different in its wing-markings from its corresponding ♂, which is undoubtedly the *L. trimaculata* of De Geer and Fabricius, but is very like *L. pulchella*, and especially the ♀ of that species. It is true that in 1793 Fabricius identified his *L. bifasciata*, 1775, both with Drury's figure of *L. pulchella* and also with Petiver's figure (*Gazophylacium*, i. pl. xv. fig. 2) of what is clearly intended for *L. lydia*, ♀. This is, however, evidently a case of confusion, due to the similar appearance of the two insects, and the difference in size was overlooked. But it is a very significant fact that Fabricius compares both *bifasciata* and *trimaculata*, in respect of build and size, with *L. depressa*, Linn., and it may be more natural to look upon them as the ♀ and ♂, respectively, of the same species, *L. lydia*, than to regard *bifasciata* as *L. pulchella*, which is decidedly larger than *L. depressa*, and *trimaculata* as *L. lydia*, ♂, which is rather smaller than *L. depressa*.

The fact that the specimen under consideration undoubtedly belongs to *trimaculata*, and is the only one of the kind in the British Museum which possesses any label in Fabricius's handwriting, would lead one to suppose that it is really the type of his description of that species. But this view of the matter seems to be negatived, both by the description itself, and by the two figures (De Geer, *Mém. Ins.* iii. pl. xxvi. fig. 2, and Petiver, *Gazoph.* i. pl. xv. fig. 1) cited in illustration of it, all of which apply to the male sex alone.

(2) *Libellula vibrans*, F. ♀. Type.

*Labels*:—“*Libellula vibrans* Fab.”; “Georgia.”

*Diagnosis*:—“*L. alis planis albis: macula media atra*

apicibusque ferrugineis. Habitat — — Mus. Britann."—F., Ent. Syst. ii. p. 380, no. 30 (1793).

Although Fabricius did not indicate any locality for this type, it nevertheless carries a small round label inscribed "Georgia." The fact that the written surface of the label had been placed in direct contact with the pectus of the dragonfly no doubt led to its being overlooked. The specimen is in an unusually good state of preservation, and the measurements are as follows:—Abdomen 39.5 mm., hind wing 49 mm., pterostigma 7 mm. In the fore wings the triangles are 3-celled, the subtriangles are 6-celled, and the antenodals number from  $16\frac{1}{2}$  to 18. At the base of each wing a dark line in the subcostal space reaches nearly to the third antenodal. The nodal spot on all wings is small, and no markings of any kind lie between that spot and the pterostigma. The brown apical cloud on all wings is small, not reaching inwards much beyond the distal end of the pterostigma.

### XLIII.—*A new Vole from Palestine.*

By OLDFIELD THOMAS.

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IN 1913 the British Museum received as a donation from Mr. N. Charles Rothschild six voles from Ekron, south-east of Jaffa, and these were provisionally put down as *Microtus syriacus*, Brants.

Inquiry was, however, made of Prof. Matschie as to certain details of the type of that species, and with the help of his account I am now able to recognize that the Ekron vole is distinct and should be described as new.

#### *Microtus philistinus*, sp. n.

Like *M. lydius*, Blackler, but bullæ larger.

Size and general colour above quite as in *M. lydius*, the back sandy brown, rather more buffy than Ridgway's "buffy brown." Sides more buffy, but not so strongly as in *lydius*. Under surface washed with buffy, more so than in *lydius*, in which the ends of the hairs are greyish white, less so than in *guentheri*. Hands and feet buffy fawn. Tail as long as in *lydius*, longer than in *guentheri*; its upper surface terminally distinctly blackened, which is not the case in *lydius*; its lower surface pale buffy—white in *lydius*.

Skull and teeth like those of *M. lydius*, with the important exception that the bullæ, although unusually variable in size, are conspicuously larger in most specimens and slightly larger in all. Height from crown to molars markedly less than in *M. hartingi*.

Dimensions of the type:—

Head and body 125 mm.; tail 33; hind foot 20.

Skull: condylo-incisive length 29.7; zygomatic breadth 16.5; nasals  $8.2 \times 3.9$ ; length of brain-case from postorbital angle backwards 13.6; palatilar length 14.8; diastema 9; palatal foramina 5.5; length of bulla from front of paroccipital process in a straight line forwards 8.5; upper molar series (crowns) 6.9.

*Hab.* Ekron, S.E. of Jaffa, Palestine.

*Type.* Adult male. B.M. no. 14. 1. 16. 1. Collected 1st December, 1913, by T. Aharoni. Presented by the Hon. N. C. Rothschild. Six specimens.

From *M. guentheri*, Danf. & Alst., this species is distinguished by its longer tail, and from *M. lydius* by the various characters above enumerated, notably by its larger bullæ.

With regard to the two voles from Palestine described long ago by Brants & Wagner, "*Hypudæus syriacus*" and "*Hypudæus cinerascens*," the latter is soon disposed of, as it is clearly a hamster (*Cricetulus*), and not a vole at all. Mr. Aharoni has sent examples from Jaffa agreeing with the description in every detail.

*Microtus syriacus*, from the Lebanon (*vide* Matschie), is said to be a greyish, not a sandy-brown, species, and the accounts of the type sent me by Prof. Matschie show it to have been smaller than *M. philistinus* (upper tooth-row 5.7 mm., diastema 6.9), and to have been apparently of a different group of voles. For he says of the teeth that  $m_1$  has only seven spaces, with four projecting angles on its outer side, numbers never found in the present group, in which nine spaces and five outer angles always occur.

Whether *M. syriacus* may prove to be a young *Chionomys* or some totally different form of vole, still remains to be seen. Both Brants and Matschie have been struck by the unusual length of its whiskers, the longest of which measures 36.5 mm. Those of *M. philistinus* are of quite moderate length.

I have provisionally used a binomial for the Ekron vole, but think it probable that it may grade into *M. lydius* and *guentheri*, the latter the earliest described of the group.

XLIV.—On the small Hamsters that have been referred to *Cricetulus phæus* and *campbelli*. By OLDFIELD THOMAS.

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THE small unstriped Hamsters with naked soles, which occur over an area ranging from the Crimea, Asia Minor, and Palestine on the west to the Altai, Kashghar, and Ladak on the east, have all been either referred to one species, called *phæus*, or occasionally split up into several on size, a character that proves most illusory. Both their nomenclature and characters still remain in much confusion.

Firstly, I regret to say that the name *phæus* does not stand for any of them, as it is antedated by an earlier term.

In 1773\* Pallas described, of this group, the species *migratorius* (type-locality: R. Ural, S.W. of Orenburg), *sungorus*† (R. Irtish, Siberia), *arenarius* (Irtish), and *barabensis* (Irtish), the first and fourth of which he changed in the 'Glires'‡ to *accedula* and *furunculus*, while he added to them *phæus* (type-locality: Lower Volga, near Sarepta). By a curious fatality, not unusual in nomenclature, this name, the latest of all, got complete dominance over the others, and has been universally used to the present time. No doubt the wide utilization of Pallas's well-known 'Glires' was the cause of the mistakes involved.

Putting aside *sungorus* and *barabensis* (*furunculus*) as not of the "*phæus*" group, we may first accept without hesitation Dr. Satunin's opinion§ that *accedula* (i. e. *migratorius*) is the same as *phæus*, both being from the same region of Southern Russia. This acceptance, however, involves the use of the senior name, *migratorius*, and the consequent disappearance of *phæus*. Dr. Satunin also considers *arenarius*, from the Irtish, as the same species.

On laying out the whole Museum series assigned to "*phæus*," rather more than 80 in number, I find that while the Central Asiatic forms are, as a general rule, larger, with larger teeth and longer hair than those from the west, yet that both skull and teeth vary in series of each form to such an extent as to overlap each other. I therefore provisionally

\* Reise, ii. pp. 703-704 (1773).

† *Sungorus* cannot be treated as a misprint for *songarus*, as has commonly been done, for it not only occurs both in text and plate, but is also used in the same form for another animal on p. 730.

‡ P. 86 (1779).

§ Mittheil. Kaukas. Mus. ii. p. 340 (1906).



combine them all (except a set from Ladak) as one species, which, as shown above, should bear the name *migratorius*.

The status of the Grecian form, *Cricetulus atticus*, and that of Palestine, to which the name *cinerascens*\* applies, I do not propose at present to discuss, but I confess I doubt very much if either of them deserves specific distinction from *C. migratorius*.

Putting aside these, the subspecies of *C. migratorius* which may be recognized appear to be as follows :—

*C. migratorius migratorius*, Pall.

Synn. *accedula*, Pall., *phæus*, Pall., *eversmanni*, Brandt.

*Type-locality*. R. Ural.

*Range*. S. Russia, Caucasus region, Transcaspia, Persia, and Asia Minor south of the coastal forest-region of the north-east.

Size comparatively small; skull about 27 mm. in length, its upper tooth-row 4 mm., the teeth themselves narrow and light. Fur short, hairs of back about 9 mm. in length. Colour above pale grey, generally with indistinct median darker dorsal shading. Hairs of under surface with grey bases, except that they are wholly white on an area on the throat, which extends in a median point down to between the fore legs.

*C. migratorius vernula*, subsp. n.

*Type-locality*. Khotz, near Trebizond.

Range no doubt all the forest coastal strip along the south-east corner of the Black Sea.

Size averaging slightly larger than in true *migratorius*. Fur of back 8–9 mm. in length. Colour darker throughout, the upper surface near “mouse-grey,” the median dark dorsal area faintly evident. Hairs of under surface with a shorter length of white above the slaty, and the white itself not so pure, but faintly suffused with buffy; white throat-area less extended towards the chest, ending about halfway towards the fore limbs. Ears with proectote markedly blackish. Tail distinctly darker above, at least for its basal half.

Dimensions of type :—

Head and body 115 mm.; tail 32; hind foot 17; ear 17·5.

Skull: greatest length 28·2; condylo-incisive length 26; palatal foramina 5; upper molar series 4·2.

\* *Hypudæus cinerascens*, Wagn. Wieg. Arch. 1848, p. 184.

*Type.* Adult female. B.M. no. 6.5.1.83. Original number 2443. Collected 25th February, 1906, by A. Robert. Presented by Oldfield Thomas. Seven skins and six specimens in spirit.

A darker and more saturate race of *C. migratorius*, a variation which occurs in other forms from the same district. Its range eastwards into Trans-Caucasia remains to be worked out, but a specimen in spirit from the Talysch Mts. appears to be very similar to it. To the south, a specimen from "60 miles north of Erzeroum" (*Woosnam*) would also seem to be referable to the same species.

*C. migratorius arenarius*, Pall.

*Type-locality.* Baraba Steppes, Lower Irtysh, Siberia. Southwards to Lake Balkhash.

Under surface wholly white, the hairs white to their bases.

A spirit-specimen from Mt. Bek Dauata, north of Lake Balkhash (*W. Bateson*), has head and body 94 mm., tail 26, hind foot 15. Its skull measures 28.5 mm. in total length, its tooth-row 4.2 mm.

The Museum only contains the above-mentioned spirit-specimen, whose agreement with Pallas's description as to the whiteness of the under surface leads me to assign it to the true *arenarius*, and to consider the next form, of which we have a large number of specimens, as distinct.

*C. migratorius griseiventris*, Sat.

*Type-locality.* R. Bis-shen-gol, Altain-nuru, Gobi Altai.

*Range.* Central Asia. Samarkand and eastwards along the Thian Shan, filling up the area between the ranges of *arenarius* and *fulvus*.

Size averaging larger and teeth heavier than in the western forms. Fur longer—hairs of back 10 mm. or more. General colour above pale grey, more or less strongly suffused with buffy or fulvous. Under surface with the hairs snowy white to the bases on throat and inguinal region, but broadly slaty at base on the belly.

A male from Djarkent measures:—Head and body 120 mm.; tail 27; hind foot 16. Skull: greatest length 30; upper tooth-row 4.5.

Of this form the Museum possesses a fine series from Djarkent, collected by W. Rückbeil, besides specimens from Samarkand, Dzungaria, Hami and elsewhere in the Carruthers collection. It differs from *C. m. arenarius* by the presence of broad slaty bases on the belly hairs,

*C. migratorius fulvus*, Blanf.

*Type-locality.* Kashgar.

Range between  $35^{\circ}$  and  $41^{\circ}$  N.,  $74^{\circ}$  and  $80^{\circ}$  E., so far as our specimens show, but probably extending considerably further, especially towards the east.

Like *C. m. griseiventris* in all respects except that the general colour is a little paler; the white of the under surface passes higher up on the sides, and is less modified by slaty bases, which are only present, and then very inconspicuously, on the centre of the belly.

Mr. Holmes-Tarn collected some specimens of this beautiful little Hamster on the Karakash River, Chinese Turkestan, and Mr. Carruthers an example on the north side of the Karakoram Mts. The original specimens were obtained during the Yarkand Mission, and the type is in Calcutta.

Subspecies *fulvus* and *griseiventris* are no doubt very closely allied, but may apparently be distinguished by the darker colour and greater amount of slaty on the belly of the latter.

In the nearly or quite pure white belly *fulvus* agrees with the typical *arenarius* of much further north, though the two appear to be separated by the range of *griseiventris*. Specimens from many further localities will be needed before the exact relations of the three can be determined.

Although I provisionally accept Dr. Satunin's view as to the Central Asian Hamsters belonging to the same species as *C. migratorius*, I think it not improbable that they really ought to be divided into two species—a small-toothed one, of which *migratorius* and *vernula*, and perhaps *arenarius*, would be subspecies; and a large-toothed Asiatic one, consisting of the subspecies *fulvus* and *griseiventris*.

But the following animal must in any case be distinguished as a species:—

*Cricetulus alticola*, sp. n.

General characters and colour above about as in *C. m. fulvus*, but the hairs of the under surface broadly slaty at base, even on chest and throat, those of the chin being alone white to their roots. Ears grey, not darkened on the proctote. Tail heavily haired, wholly white.

Skull distinguished from that of all forms of *C. migratorius* by its conspicuously smaller bullæ, small both vertically and horizontally. Palatal foramina comparatively long, parallel-sided.

Dimensions of type (measured in the flesh):—

Head and body 98 mm.; tail 31; hind foot 15·5; ear 15.

Skull: greatest length 27; condylo-incisive length 24; palatilar length 11·3; palatal foramina 5·5; breadth of bulla at right angles to its greatest diameter 3·3; upper tooth-row 3·9.

*Hab.* Ladak. Type from Shushal, 13,500'; other specimens from Durgu Vil and Khardong (*Crump*), and Teza, Upper Suttlej Valley (*Whitehead*).

*Type.* Adult male. B.M. no. 6. 10. 3. 13. Original number 115. Collected 29th June, 1906, by C. M. Crump, and presented to the National Museum by Col. Ward. Four specimens in all.

This Hamster has a quite extraordinary resemblance to the pale-coloured Voles of the genus *Alticola* (e. g., *A. stracheyi*, *cricetus*, or *phasma*), with which it agrees in proportions, length and colour of fur, and external appearance generally; it even has, unlike *C. migratorius*, their slaty-based throat-hairs. In fact, the only points that show it is not a Vole are the shorter and more "pudsy" feet and the finely-haired untufted ears—neither of which affect the general appearance.

*C. m. fulvus* is also very like *Alticola phasma* above, but the resemblance is spoilt below by the nearly wholly white under surface.

This Ladak Hamster is probably most nearly allied to the Tibetan *C. lama*, B.-Ham., but is considerably smaller and has a shorter tail.

With regard to the systematic-arrangement of the small Hamsters, I agree with Mr. Miller as to the advisability of generically separating my *Cricetulus bedfordiæ* from the others (genus *Phodopus*, Miller), and would, indeed, go further by also distinguishing the species *sungorus* and *campbelli*, which have an intermediate condition, both of foot-structure and dentition. The new genus might be called:—

#### CRICETISCUS, g. n.

Soles densely hairy, the three posterior of the six normal pads completely suppressed, and the three distal ones very small, hidden in the hair. Teeth neither so complicated as those of *Cricetulus*, in which there is a broad notch, and commonly a deep pit, between the outer and inner main cusps of each lamina, nor so simplified as those of *Phodopus*, in which the notch is reduced and the pit is absent.

Genotype: *C. campbelli*. (*Cricetulus campbelli*, Thos.)

Other species: *C. sungorus*. (*Mus sungorus*, Pall.)

Although *C. sungorus* was known so much the earlier, it is only represented in the material available to me by a single dried skin, in which the characters are not very clearly discernible. With both skins, skulls, and a spirit-specimen of *C. campbelli* for examination, I therefore think it advisable to make that species the genotype.

The position of Satunin's *Cricetulus roborovskii* is not clear, as his expression "Die Sohlen sind dicht mit weissem Haar bekleidet" is applicable either to a *Phodopus* or a *Cricetiscus*.

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XLV.—*Descriptions of New Pyralidæ of the Subfamilies Hydrocampinæ, Scoparianæ, &c.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Continued from p. 376.]

(1 i) *Cataclysta nyasalis*, sp. n.

Head, thorax, and abdomen white mixed with dark brown with a cupreous gloss; antennæ brown ringed with white; palpi white, black-brown above; fore and hind femora and tibiæ black-brown above; claspers of male yellowish. Fore wing with the base white, brown at costa; an inwardly oblique orange-yellow antemedial band from cell to inner margin, defined by brown lines and with white beyond the outer line; the medial area white very thickly irrorated with dark cupreous brown; postmedial line white, slightly incurved below vein 3 and ending at tornus, an orange-yellow band beyond it from below costa to vein 3; the terminal area brown with a white line from costa before apex to termen at vein 4, an orange-yellow band beyond it on termen from apex to discal fold; cilia dark brown with some white at tips. Hind wing white, very thickly irrorated with dark cupreous brown from near base to the subterminal line, which is black-brown defined on each side by white, slightly incurved below vein 2; five partly conjoined ocellate black spots on termen from below apex to above tornus, with metallic silvery points between them, the anal spot larger with the silvery point in its centre, some orange-yellow points beyond them on termen; cilia cupreous brown at base, white slightly tinged with brown at tips.

*Hab.* BR. C. AFRICA, Mt. Mlanje (*Neave*), 3 ♂, 1 ♀ type. *Exp.* 10 mm.

(2 a) *Cataclysta atriterminalis*, sp. n.

♀. Head, thorax, and abdomen pale ochreous mixed with some silvery white; palpi with the 3rd joint brownish; pectus, legs, and ventral surface of abdomen white. Fore wing white, the costal area brownish ochreous; an inwardly oblique orange-yellow ante-medial band from discal fold to inner margin, defined by brownish lines; a short orange-yellow fascia beyond the cell; brownish sub-terminal spots at veins 6 and 2 and above tornus. Hind wing white; an oblique orange-yellow medial band edged by brownish lines, the yellow extending on inner margin to near tornus; the terminal area broadly black with some whitish scales and some orange scales on termen.

*Hab.* CELEBES, Säugir I. (*Doherty*), 1 ♀ type. *Exp.* 10 mm.

(47 a) *Cataclysta obliquifascia*, sp. n.

♀. Head and thorax fulvous yellow mixed with grey-brown; abdomen brownish white, dorsally tinged with ochreous yellow except towards base and with dark brown segmental lines; antennæ dark brown except at base; palpi yellowish, the 3rd joint dark brown; pectus, legs, and ventral surface of abdomen white tinged with brown, the fore femora towards extremities, the tibiæ and tarsi dark brown, the tibiæ banded with yellowish, the mid tibiæ with dark brown stripe above, the tarsi ringed with dark brown. Fore wing fulvous yellow; small subbasal and antemedial brown spots on costa and slight brown marks on inner margin before and at middle; an obliquely curved reddish-brown fascia from costa before apex to middle of discocellular, with a whitish fascia below it; an oblique rather diffused reddish-brown line from before termen at discal fold to inner margin before tornus, with some whitish beyond it; a fulvous-yellow terminal band defined on inner side by a reddish-brown line; cilia white at base, brown at tips. Hind wing golden yellow, the costal area to below the cell and to beyond middle white; an oblique dark brown medial band from cell to inner margin, and a rather diffused oblique postmedial line from vein 4 to inner margin; an incurved subterminal brown line from costa to discal fold; a series of small black-brown spots before termen from below apex to vein 2, some metallic silver beyond them on termen; cilia yellow at base, with black line at middle, the tips white tinged with brown.

*Hab.* BRAZIL, Pernambuco (*Swale*), 1 ♀ type. *Exp.* 16 mm.

(51) *Cataclysta chionostola*, sp. n.

♀. Head and thorax white slightly tinged with rufous; abdomen white; antennæ brownish except towards base; pectus, legs, and ventral surface of abdomen white, the fore legs slightly tinged with rufous and the tibiæ with black-brown streak below. Fore

wing silvery white; two cupreous-brown points at base; antemedial line cupreous brown, oblique to above vein 1, then inwardly oblique, a patch of pale yellow before it below the cell; a very oblique cupreous-brown line from middle of costa to below submedian fold well beyond middle, then recurved to inner margin, an oblique striga beyond it in end of cell and another beyond the cell, with a yellowish tinge between them; a triangular postmedial patch of the ground-colour from costa to below vein 4, defined at sides by yellow-brown lines; two cupreous-brown subterminal lines with a yellowish tinge between them, from just below costa to just above inner margin, incurved below vein 3; a cupreous-brown line before termen. Hind wing silvery white; a faint yellow and brown tinge in and below middle of cell; a straight oblique cupreous-brown medial line; postmedial line cupreous brown, incurved between veins 6 and 2; two cupreous-brown subterminal lines with a yellowish tinge between them, the inner line slightly incurved between veins 6 and 2, the outer angled outwards at vein 6, then slightly waved and joining the inner line at submedian fold; a cupreous-brown subapical striga and a line before termen from the angle of the outer subterminal line to vein 2.

*Hab.* PERU, Rio Pacaya, 1 ♀ type. *Exp.* 18 mm.

(4 a) *Ambia chrysogramma*, sp. n.

Head, thorax, and abdomen white, the last slightly tinged with brown on dorsum; antennæ with an ochreous tinge. Fore wing silvery white, the costa tinged with orange-yellow towards base; a small tuft of rufous scales below middle of costa with the orange-yellow antemedial and medial lines arising below it and rather diverging towards inner margin; a conical postmedial patch defined by orange-yellow from costa to vein 5, with a brown point on the line defining its outer side at costa; an orange-yellow subterminal line, excurved to submedian fold, where it is angled inwards, a fine yellow-brown line beyond it, incurved below vein 2, the terminal area tinged with yellow. Hind wing silvery white; a small orange-yellow discoidal spot; an orange-yellow postmedial line, excurved to vein 4, then bent inwards to origin of vein 2 and oblique to inner margin; an orange-yellow subterminal line, excurved to vein 2, then incurved, a fine yellow-brown line beyond it; the terminal area tinged with yellow.

*Hab.* SAMOA Is., Pago (*de la Garde*), 1 ♂, 1 ♀ type. *Exp.* 12 mm.

(9 b) *Ambia cymophoralis*, sp. n.

♂. Head white, the antennæ tinged with ochreous, the palpi yellow behind; thorax and abdomen white, the tegulæ with subdorsal orange-yellow stripes, the patagia orange-yellow above and the dorsum of thorax orange-yellow except the metathorax, the abdomen banded with orange-yellow; pectus, legs, and ventral

surface of abdomen white, the fore femora above and tibiae on inner side yellowish with some black at the femoro-tibial joint. Fore wing orange-yellow with a fulvous tinge; some white at base in and below the cell; an erect silvery-white subbasal band; a silvery-white band just before middle, defined on each side by dark brown below the cell, excurved below the costa and above inner margin and emitting a spur at discal fold to the white discoidal lunule defined by black except above; the medial part of costa white; a silvery-white wedge-shaped mark in discal fold before the post-medial band, which is silvery white defined on each side by dark brown, incurved below costa, then excurved to vein 3, below which it is angled inwards, then erect with its outer edge excurved at submedian fold; a silvery-white subterminal band from costa to vein 1, defined on each side by dark brown, strongly on outer side, its extremities at costa and above vein 1 dilated into spots, excurved between those points; cilia white, chequered with brown at apex and with orange-yellow at middle and tornus. Hind wing orange-yellow with a slight fulvous tinge, the base white; a silvery-white antemedial band from cell to inner margin connected with a silvery-white patch in end of cell with a black discoidal bar on its outer edge; a silvery-white postmedial band, excurved and defined on outer side by brown to vein 2, then incurved; a silvery-white subterminal band defined on each side by black from costa to vein 1, its extremities on costa and above vein 1 expanding into spots, excurved between those points; cilia white, chequered with red-brown towards apex and at middle.

*Hab.* LOUISIADE Is., St. Aignan I. (*Meek*), 3 ♂ type, Rossel I. (*Meek*), 1 ♀. *Exp.* 16-18 mm.

(16 a) *Ambia rufitincta*, sp. n.

♀. Head, thorax, and abdomen white suffused with rufous, the last slightly irrorated with dark brown towards base and strongly with black towards extremity; antennae white tinged with yellow; palpi white tinged with yellow and with some black above; pectus, legs, and ventral surface of abdomen yellowish white. Fore wing white suffused with rufous and slightly irrorated with brown; a faint inwardly oblique rufous antemedial line; a curved black medial line, rather diffused on inner side and incurved at median nervure; an oblique slightly curved blackish postmedial line from costa to vein 2 above tornus, defined on outer side by white; a fine brown terminal line from costa to vein 2. Hind wing white suffused with rufous and slightly irrorated with brown except on inner area; a patch of diffused black scales in and beyond end of cell; postmedial line black, oblique and defined on outer side by white to vein 4, then obsolete and retracted to beyond lower angle of cell, then curved and rather diffused to inner margin; a fine brown terminal line except toward tornus.

*Hab.* PERU, Cuzco Mts. (*Garlepp*), 1 ♀ type. *Exp.* 14 mm.



(17 a) *Ambia hemigrammalis*, sp. n.

♀. Head, thorax, and abdomen white mixed with fulvous yellow and irrorated with some black scales; palpi white banded with black; pectus, legs, and ventral surface of abdomen white, the fore tibiæ banded with black. Fore wing white; a subbasal black bar from costa; an antemedial black line from costa to discal fold and some scales at inner margin; a broad oblique orange-yellow shade from below costa before the postmedial line to inner margin before middle, irrorated with some black scales and with black striæ on it on each side of the discocellulars; a strong oblique black postmedial line from costa to discal fold, then an incurved shade formed by blackish scales with the area beyond it orange-yellow; an orange-yellow bar from costa before apex, then a double curved black line filled in with silvery white; the terminal area orange-yellow, narrowing to a point below apex; cilia white, black at base at apex and with a black patch between veins 4 and 2. Hind wing white, the basal area irrorated with black and with a black patch at end of cell; the terminal half suffused with orange-yellow and slightly irrorated with brown; a dark brown shade between veins 7 and 2 before the indistinct double dark postmedial line filled in with white; a narrow white band defined by slight dark lines before the termen which is yellow, the band not extending to tornus; cilia white, dark brown at base from vein 4 to tornus.

*Hab.* PERU, Yungas de la Paz (*Seebold*), 1 ♀ type. *Exp.* 12 mm.

(17 b) *Ambia sufetulodes*, sp. n.

♀. Head, thorax, and abdomen white mixed with dark brown, the prothorax and patagia at middle with brown spots, the abdomen suffused with brown towards extremity, leaving white segmental lines; palpi and maxillary palpi white banded with black; pectus, legs, and ventral surface of abdomen white, the fore tibiæ, spurs, and tarsi banded with black. Fore wing white, the basal and terminal areas suffused with brown, the medial area with broad brownish shade; a white subbasal band, defined on inner side by black; a white antemedial band, defined on each side by black and incurved below submedian fold; two semicircular white marks defined by black on medial part of costa, the first with black point at costa; a small round black discoidal spot; a postmedial white band defined on each side by black, excurved to vein 5, then incurved, expanding somewhat at costa; an oblique white streak from apex and a blackish line before termen excurved at middle; a dark terminal line except at the excision at discal fold; cilia white with some brown at apex and middle. Hind wing white, the terminal area suffused with brown, broadly towards costa and narrowing to tornus; some brown near base; a broad oblique

brown band from discal fold before the small blackish discoidal spot to inner margin before the postmedial line, with a white bar on it at inner margin; postmedial line black defined on outer side by white, incurved below discal fold, then excurved; a black line before termen; a black terminal line from apex to vein 3 except at the excision at discal fold, and black striæ at veins 2 and 1; cilia white with some brown at apex and middle.

*Hab.* PERU, R. Pacaya, 1 ♀ type. *Exp.* 14 mm.

(22 b) *Ambia fulvicolor*, sp. n.

♂. Head, thorax, and abdomen yellow suffused with fulvous, the last with subdorsal white segmental bands; frons and 3rd joint of palpi white; pectus, legs, and ventral surface of abdomen white tinged with fulvous. Fore wing yellow suffused with fulvous; an oblique subbasal silvery-white band from cell to inner margin, with some red-brown before it; some dark brown on costa before the antemedial silvery-white band, which is interrupted in the cell, oblique towards costa and below the cell and defined by red-brown; the cell suffused with red-brown except towards base; a fulvous lunule at end of cell defined by dark brown and with some white beyond it; the fovea above end of cell white defined by dark brown and with a silvery-white point above it on costa; some dark brown on costa before an oblique silvery-white postmedial band from costa to vein 4 and a triangular mark from vein 2 to inner margin, both defined on outer side by the dark brown postmedial line which is angled inwards at vein 2, the costa beyond it dark brown; a slightly sinuous dark brown subterminal line with a series of small silvery-white spots before it from below costa to inner margin, the hair on which is dark brown below it; cilia white mixed with some yellow and chequered with dark brown below apex and at veins 4, 3, 2. Hind wing yellow suffused with fulvous along median nervure and on terminal area, the base white; an oblique silvery-white antemedial band defined by dark red-brown; a fulvous discoidal spot defined by dark red-brown; postmedial line dark brown defined on inner side by a silvery-white band, slightly incurved below vein 4; a sinuous dark brown subterminal line defined on inner side by silvery-white spots, small to vein 5, then interrupted to just above vein 3, larger and more diffused below vein 3; cilia white mixed with some yellow, chequered with dark brown at apex and between veins 5 and 2.

*Hab.* BR. N. GUINEA, Kumusi R. (*Meek*), 1 ♂ type. *Exp.* 18 mm.

(23 b) *Ambia albiflavalis*, sp. n.

♂. Head, thorax, and abdomen white tinged with yellowish; antennæ ochreous; frons yellow; palpi yellow with the 3rd joint white; pectus, legs, and ventral surface of abdomen white. Fore

wing silvery white; the base orange-yellow with oblique outer edge; an obliquely curved orange-yellow antemedial band; an orange-yellow band from end of cell to inner margin, the end of cell tinged with brown and the fovea above it with two brown points on its upper edge, a yellow patch with a white spot on it beyond it on costal area; an orange-yellow subterminal band defined at sides by brown, obliquely curved to vein 2, then bent outwards to tornus, giving off on inner side between veins 4 and 2 a yellowish fascia tinged with brown to lower end of cell; a pale brown terminal band. Hind wing silvery white; an orange-yellow antemedial band from cell to inner margin; a curved orange-yellow postmedial band defined by red-brown from costa to vein 1, its outer edge angled outwards at vein 4; a sinuous orange-yellow subterminal band defined by red-brown and ending at tornus, its outer edge excurved at discal fold to the narrow orange-yellow terminal band defined on inner side by a red-brown line and ending at submedian fold.

*Hab.* S. NIGERIA, Lagos (*Dudgeon*), 1 ♂ type. *Exp.* 14 mm.

(23f) *Ambia niveiplagalis*, sp. n.

♂. Head, thorax, and abdomen white mixed with red-brown and dark brown, the head with dark line between antennæ, the tegulæ dorsally and patagia at middle with white patches, the abdomen pale towards extremity and with white bands; antennæ yellowish ringed with black; palpi pale red-brown, the 3rd joint white with red-brown band towards extremity; pectus, legs, and ventral surface of abdomen white, the fore legs tinged with red-brown, the abdomen with faint brownish bands. Fore wing yellowish tinged with rufous and irrorated with dark brown; an inwardly oblique blackish antemedial line, excurved above inner margin and with a dark shade before it from subcostal nervure to inner margin; an oblique slightly sinuous blackish medial line with a white striga before it in and below the cell, where it is conjoined to a silvery-white patch below the submedian fold extending to inner margin and to the antemedial line; a quadrate silvery-white spot beyond the cell defined by blackish and a quadrate patch from vein 2 to inner margin defined by blackish at sides, the fovea above end of cell white; an oblique elliptical silvery-white patch defined by blackish from costa, to which it narrows, to vein 4; an apical white spot, then a curved series of white spots defined by blackish, minute to vein 3, the spots below veins 3 and 2 larger; cilia red-brown mixed with white. Hind wing yellowish tinged with rufous and irrorated with dark brown; a broad subbasal silvery-white band defined by dark brown and with red-brown spot on it at inner margin; a rather lunulate silvery-white spot beyond the cell defined by dark brown; a rounded postmedial silvery-white patch defined by dark brown from costa to vein 4, a spot below vein 3, and a curved band from vein 2 to above tornus; a triangular silvery-

white apical spot, small conjoined subterminal spots above and below vein 4 and larger rather wedge-shaped spots below veins 3 and 2; cilia reddish brown mixed with some white.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 1 ♂ type. *Exp.* 20 mm.

(30 b) *Ambia melanistis*, sp. n.

♀. Head, thorax, and abdomen black-brown mixed with some white; pectus, legs, and ventral surface of abdomen white. Fore wing very dark red-brown with a blackish tinge; an antemedial white point on costa and medial bar from costa; a slightly ex-curved punctiform white postmedial line from costa to discal fold, the line then almost obsolete and incurved below vein 4, with white points above and below vein 1, a metallic silvery patch before it between veins 3 and 1 and a small spot at middle of inner margin; a curved punctiform white subterminal line; cilia whitish. Hind wing very dark red-brown with a blackish tinge; the basal part of costa white; an antemedial white point on inner margin; a small metallic silvery spot beyond the cell; an oblique postmedial white band from costa to vein 4 and a minute spot above tornus; a curved white subterminal line from costa to discal fold and a series of striae between discal fold and vein 1; the termen more rufous; cilia white.

*Hab.* FORMOSA, Kanshirei (*Wileman*), 1 ♀ type. *Exp.* 12 mm.

[(38 a) *Ambia argentistriata*, sp. n.

Fore wing of male on underside with large costal fold from before middle to near apex; hind wing in both sexes on upperside with tuft of long spatulate hairs below end of cell.

♂. Head, thorax, and abdomen yellow, the tegulae and patagia with scarlet streaks, the abdomen dorsally suffused with rufous; palpi tinged with rufous; pectus, legs, and ventral surface of abdomen white tinged with rufous. Fore wing orange-yellow; the basal area suffused with scarlet, irrorated with a few black scales and with some silver scales below costa; a curved scarlet antemedial line; the medial area except towards costa and the postmedial area below vein 4 with a silvery gloss finely striated with dark brown; a scarlet line from upper angle of cell, oblique to vein 3, then erect, with a yellow streak tinged with scarlet in submedian fold to the antemedial line and beyond it on the silvery area, the area beyond the line, except the silvery area, yellow tinged with scarlet with brilliant silver streaks defined by black scales in the interspaces of the postmedial area from below costa to vein 4 and a streak of black scales below vein 4, its extremity connected by a line formed by black scales with the inner margin and incurved at submedian fold; a curved brilliant silver line before termen and a terminal series of black striae; cilia with brown mixed

except at base. Hind wing white; a triangular area from origin of vein 2 to termen between discal fold and vein 2 orange-yellow; the tuft of scales below end of cell black; a curved scarlet post-medial line between veins 5 and 2; a brilliant silver line before termen from costa to vein 5, then a series of small brilliant silver spots with black points before and beyond them on each side of veins 4 to 2; the termen narrowly orange-yellow to apex; cilia white, their bases orange-yellow with a brown line at base to vein 2.

Ab. 1. Head, thorax, abdomen, fore wing, and the triangular patch on hind wing yellowish suffused with rufous, the scarlet markings replaced by rufous, the fore wing with silvery marks before the antemedial line in the interspaces.

*Hab.* W. COLOMBIA, Jimenez, 1 ♂ type, W. slopes, 1 ♂. *Exp.* 20 mm.

(38 c) *Ambia phæomerals*, sp. n.

♀. Head, thorax, and abdomen grey-white mixed with brown; palpi, pectus, legs, and ventral surface of abdomen white tinged with brown, the tarsi dark brown ringed with white. Fore wing grey-white thickly irrorated with brown; an indistinct brown medial line defined on inner side by whitish, excurved to median nervure, then sinuous; a slight dark discoidal spot; a large patch of dark brown suffusion from costa to vein 2 before the postmedial line which is white slightly defined on outer side by brown and excurved from costa to vein 2 near termen, then almost obsolete and retracted to below the angle of cell, then more distinct, defined on inner side by brown and waved to inner margin; a series of dark striæ before termen from below apex to above tornus. Hind wing white thickly irrorated with dark brown, the base, cell, and costal area to near apex white; the tuft of hairs below end of cell black-brown; subterminal line white, excurved to vein 2, then sinuous; a series of ocellate black spots on termen from apex to submedian fold, defined on inner side by white with a fine sinuous dark line before it and with slight orange marks between them, the spots from apex to discal fold minute, then larger and with a black line beyond them on termen; cilia white, metallic silver at base.

*Hab.* BOLIVIA, Yungas de la Paz (*Seebold*), 1 ♀ type. *Exp.* 22 mm.

(4 a) *Oligostigma centrimacula*, sp. n.

Antennæ of male fringed with hair above at one-third from base; hind tibiæ fringed with hair below towards base.

Head and thorax white, the head tinged with rufous behind, the patagia with some black-brown on outer edge; abdomen white, suffused with pale yellow except towards extremity; antennæ tinged with rufous; palpi with some black on extremity of 2nd joint behind; pectus, legs, and ventral surface of abdomen white,

the fore femora above and tibiae on inner side black, the tarsi ringed with black. Fore wing orange-yellow, the costa red-brown to end of cell; a white fascia in the cell from before middle extending to well beyond the cell and with the dark cupreous red-brown discoidal spot on it; a curved silvery-white subterminal band defined on outer side by a black line from below costa to submedian fold in which it is bent inwards as a streak; a fine brown terminal line; cilia white. Hind wing with the basal half white with oblique outer edge defined by a strong black-brown line between discal and submedian folds; the terminal half orange-yellow with oblique silvery-white subterminal bar from costa to vein 6 and subterminal silvery-white band defined by dark brown lines between veins 4 and 1; four minute rather quadrate black spots on termen between vein 5 and submedian fold; cilia white, metallic silvery at base beyond the spots.

*Hab.* QUEENSLAND, Kuranda (*Dodd*), 1 ♂, 1 ♀ type. *Exp.* 16 mm.

(1 c) *Oligostigma peruviansis*, sp. n.

Head and thorax dark brown mixed with white, the patagia with white streak on upper edge towards base, the metathorax edged with white; abdomen brown with white segmental bands; antennae white ringed with brown; palpi brown with some white in front and at tips; pectus, legs, and ventral surface of abdomen white, the legs tinged with brown, the abdomen tinged with brown except towards base and with white segmental lines. Fore wing cupreous brown mixed with some ochreous; an obliquely curved somewhat dentate blackish subbasal line defined on each side by slight white marks except towards costa; antemedial line white defined on each side by dark brown, oblique to median nervure, angled outwards at median nervure and submedian fold, then very oblique, forked white streaks beyond it at submedian fold; the medial area with white spots on costa, in the cell, and at inner margin; a white medial line, oblique to submedian fold, then excurved; a rather lunulate black discoidal spot defined by ochreous; the postmedial area with a loop formed by sinuous white lines from costa to vein 2, enclosing a white band to vein 4 rather constricted below costa; a narrow white band from below costa to vein 1, its inner edge irregular and incurved at discal and submedian folds before an orange-yellow terminal band defined on inner side by a black line and on outer by black striae on termen; cilia white with a brown line near base and the tips with brown mixed. Hind wing cupreous brown; a sinuous white subbasal band; a white antemedial line; a broad white medial band; postmedial line white, angled inwards below costa and outwards at vein 4, then bent inwards and sinuous to inner margin; a white band with sinuous inner edge from discal to submedian fold before the terminal orange-yellow band defined on inner side by a black line; a series of five small ocellate black

spots on termen from vein 7 to below 4, the spots below veins 7 and 5 double, each with a white point on them; cilia white mixed with brown and with a brown line near base.

Ab. 1. Fore wing without the white in end of cell or in the postmedial loop.

*Hab.* PERU, Carabaya, R. Huacamayo, La Union (*Ockenden*), 1 ♂, 1 ♀, La Oroya (*Ockenden*), 2 ♂, 3 ♀ type. *Exp.*, ♂ 22–26, ♀ 32–38 mm.

(1 d) *Oligostigma rufiterminalis*, sp. n.

♀. Head and thorax greyish suffused with red-brown; abdomen whitish tinged with red-brown and slightly irrorated with black; palpi white tinged with red-brown and irrorated with black; pectus, legs, and ventral surface of abdomen whitish, the legs tinged with red-brown, the fore tibiæ with white band at middle and black band at extremity. Fore wing greyish suffused with red-brown; blackish points near base in and below the cell; a rather diffused black antemedial line, excurved to below vein 1 and bent inwards to inner margin; the medial area with rufous streaks irrorated with black in discal and submedian folds; a somewhat inwardly oblique black medial line, slightly excurved below costa; an elliptical rufous discoidal spot defined by black; postmedial line black slightly defined on outer side by whitish, very slightly waved towards costa, then excurved to vein 2, where it is strongly angled inwards, then oblique; a narrow silvery-white band from below costa to vein 1, above which it forms a small spot with a deeper red-brown shade before it, before the narrow orange-yellow terminal band defined on inner side by a black line; cilia whitish tinged with red-brown. Hind wing whitish tinged with red-brown, the area beyond the postmedial line rufous; a curved black subbasal line; a round yellow discoidal spot defined by black; postmedial line black, excurved to vein 3, then incurved; a narrow silvery-white subterminal band defined on outer side by a black line with some yellow beyond it; the termen narrowly whitish between veins 6 and 2, with four minute black spots on it; cilia whitish tinged with red-brown.

*Hab.* MADAGASCAR, 1 ♀ type. *Exp.* 24 mm.

(12 a) *Oligostigma piperitalis*, sp. n.

♀. Head and thorax grey tinged with rufous and irrorated with dark brown; abdomen white with diffused rufous bands; antennæ dark brown, pale red-brown towards base; palpi red-brown; pectus, legs, and ventral surface of abdomen white, the fore and mid legs tinged with red-brown. Fore wing grey tinged with rufous and thickly irrorated with dark brown; a short blackish streak in middle of cell and small rather diffused discoidal spot; a narrow white band from below costa to vein 1 before the fulvous-yellow

terminal band defined on inner side by a fine dark line; a fine dark terminal line; cilia whitish tinged with rufous and with a fine dark line near base. Hind wing pale rufous irrorated with dark brown; the base white; a narrow oblique white antemedial band, diffused outwards at costa; a small blackish discoidal spot; a narrow white postmedial band excurved to vein 4, then incurved; a narrow white band defined on inner side by diffused blackish and on outer by a black line from below costa to inner margin before the fulvous-yellow terminal band; a white terminal line with minute black spots on termen below veins 7, 5, 4, 3, defined on inner side by a black line which is slightly waved before the spots, the termen with a fine black line at apex and below the spots; cilia white faintly tinged with brown.

*Hab.* N. NIGERIA, Zungeru (*Macfie*), 1 ♀ type. *Exp.* 18 mm.

(18 b) *Oligostigma flaviabalis*, sp. n.

♀. Head, thorax, and abdomen white, the shoulders with some rufous, the metathorax yellow behind; palpi and maxillary palpi banded with rufous; fore tibiae tinged with rufous with a white spot at middle. Fore wing silvery white, the costa tinged with rufous at base, then with yellow to beyond middle, the inner margin with a pale yellow patch before middle; a small rufous-spot in upper part of middle of cell; a yellow discoidal spot defined by rufous scales; a silvery-white subterminal band defined by pale brown lines with diffused pale yellow before it and the terminal area beyond it pale yellow; cilia white tinged with rufous. Hind wing white; the subbasal area pale yellow, diffused on inner side and defined on outer by a pale brown line; a pale brown postmedial line, excurved below costa, the area beyond it pale yellow with a narrow silvery-white subterminal band on it; the termen with minute black bars at veins 6 to 2; cilia white tinged with rufous.

*Hab.* MADAGASCAR, Betsileo (*Cowan*), 1 ♀ type. *Exp.* 22 mm.

(23 b) *Oligostigma leucomma*, sp. n.

♂. Head and thorax fulvous yellow mixed with white; abdomen white suffused with fulvous yellow except at base; palpi white at tips; pectus, legs, and ventral surface of abdomen white suffused with fulvous yellow. Fore wing white, the costal and terminal areas suffused with fulvous yellow; black subbasal striae above and below vein 1; an antemedial fulvous-yellow band, defined on outer side by some dark scales below the cell; a slightly waved blackish medial line somewhat excurved below the costa; the outer half of medial area fulvous yellow, suffused with blackish below the cell; postmedial line blackish, defined on outer side by white to vein 4 and with a white spot before it beyond the cell, slightly incurved below costa and excurved at middle, at vein 4 bent inwards to lower angle of cell, then waved to inner margin; a black subterminal line



defined on inner side by a narrow white band, incurved from costa to discal fold and below vein 2, excurved at middle; a black terminal line; cilia white, black at apex and middle. Hind wing white, the terminal area suffused with fulvous yellow; a curved yellow antemedial line with some dark scales on it below the cell; a blackish discoidal bar; postmedial line fulvous yellow, excurved to vein 4, then bent inwards to lower angle of cell, then with some dark scales on it and excurved above inner margin; a slightly sinuous black subterminal line with a narrow white band on its inner side, excurved at middle; cilia white with a blackish line near base and some dark scales at tips to vein 2.

♀. Head, thorax, abdomen, and fore wing almost entirely fulvous yellow, the last without the white spot before the postmedial line and the white beyond the postmedial line and before the subterminal line reduced.

*Hab.* QUEENSLAND, Stradbroke I. (Turner), 3 ♂, 1 ♀ type. *Exp.* 16-18 mm.

(23 c) *Oligostigma fulvicolor*, sp. n.

♂. Head, thorax, and abdomen fulvous, the last with some yellow mixed; frons white; tarsi white at base. Fore wing fulvous mixed with some yellow; a whitish antemedial spot on costa with a slight dark streak below it; an inwardly oblique slightly sinuous silvery-white medial band defined on each side by blackish except at costa and with a slight dark streak beyond it below costa to an elongate white spot defined by dark scales above end of cell; a white point defined by dark scales at upper angle of cell and a slight oblique dark streak below lower angle with a yellow mark above it extending to the postmedial narrow silvery-white band defined on each side by black-brown except at costa, obliquely curved to vein 2, then incurved; a subterminal series of short dark streaks with some whitish on the streaks above and below vein 2; cilia dark brown. Hind wing fulvous; a narrow slightly sinuous silvery-white antemedial band defined on each side by black-brown; a similar postmedial band, obliquely curved to vein 1, then bent outwards to tornus; a subterminal series of slight rather wedge-shaped dark marks with some whitish in centres; cilia dark brown.

*Hab.* PERU, Carabaya, Oconeque (*Ockenden*), 3 ♂ type. *Exp.* 34-38 mm.

(28 b) *Oligostigma flavipictalis*, sp. n.

♀. Head, thorax, and abdomen white, the hind tarsi tinged with yellow on inner side. Fore wing silvery white; a golden-yellow patch at base of costa, slightly defined on outer side by brown; a curved golden-yellow antemedial band, slightly defined on each side by brown towards costa, where it is somewhat dilated;

a slight brown discoidal striga; an orange-yellow patch below end of cell in submedian interspace, its inner edge connected by a bar with inner margin and its outer edge defined by a slight brown line continued to inner margin; an oblique orange-yellow mark on costa above end of cell defined on inner side by a brown striga; an orange-yellow postmedial patch below costa with which its inner edge is connected by an oblique bar, defined at sides by slight brown lines; a curved orange-yellow subterminal band from costa to below vein 4 where it is bent inwards, its inner edge defined by a blackish line to discal fold and with a slight oblique brownish line from the inner side of its recurved part to tornus; a narrow orange-yellow terminal band defined on inner side by a fine black line, curved inwards at tornus. Hind wing silvery white; a curved orange-yellow subbasal band defined on outer side by a slight brown line; an orange-yellow medial band defined by slight brown lines, its outer edge forming a hook at vein 4, then incurved; an orange-yellow subterminal band defined by fine black lines, its inner edge strongly incurved from below vein 4 to submedian fold; the termen narrowly white with a fine terminal black line; cilia chequered yellow and white with some blackish scales at tips.

*Hab.* SINGAPORE (*Meade-Waldo*), 1 ♀ type. *Exp.* 14 mm.

(13 a) *Aulacodes hemimelæna*, sp. n.

♀. Head and thorax black-brown; abdomen yellowish tinged with black-brown and with some white at base; pectus white; legs and ventral surface of abdomen yellow, the fore legs tinged with red-brown, the fore femora black-brown above. Fore wing black-brown; a curved silvery-white band from below costa to vein 1 before the golden-yellow terminal band defined on inner side by black striæ and on outer by a terminal series of black points and striga at submedian interspace; cilia silvery white. Hind wing white with a black-brown patch at base, the terminal area broadly golden yellow defined on inner side by a black line between discal and submedian folds; a minute ocellate white spot defined by black on termen at discal fold, then three minute black spots with some red between them to vein 2; cilia silvery white, brown at base beyond the spots.

*Hab.* PHILIPPINES, Manila (*Ledyard*), 1 ♀ type. *Exp.* 18 mm.

(23 b) *Aulacodes quadriplagiata*, sp. n.

♂. Head and thorax fulvous yellow; abdomen white tinged with yellow; palpi with some brown at side of 2nd joint; legs yellow, the fore tibiae with dark brown band at extremities, the tarsi ringed with brown; pectus and ventral surface of abdomen white. Fore wing with the basal half black-brown except the costal area which is fulvous yellow at base, then white, and a conical white ante-

medial spot at inner margin; a medial white band leaving the costal yellow; a semicircular deep chocolate-brown postmedial patch from below costa to vein 3 defined on outer side and below by a curved silvery-white band and shading to red-brown at costa before the white band; a terminal yellow band defined on inner side by a black line to submedian fold, the yellow band bent inwards on inner area to near the basal black-brown area; a terminal series of black points and small spot below apex; cilia silvery white, tinged with brown at apex. Hind wing silvery white, the terminal area broadly bright yellow, extending on inner area to near base; the white area defined by a curved black line between discal and submedian folds; subterminal black strigæ above and below vein 2, then a curved silvery-white line to above tornus; a curved silvery-white line from costa before apex to termen at discal fold; minute silvery-white ocellate spots defined by black and with black points on their outer edge above and below vein 4 before termen; a minute black spot below vein 3 and striga below vein 2; cilia silvery white tinged with red-brown at base.

♀. Fore wing with the basal half chocolate-brown, its upper edge indented by an elongate white mark in the cell and with white streak below it on inner margin, the whole costal area above it yellow, the postmedial patch red-brown and extending to submedian fold.

*Hab.* D'ENTRECASTEAUX Is., Goodenough I. (*Meek*), 1 ♂, 2 ♀ type. *Exp.* 20-26 mm.

(24a) *Aulacodes costifascialis*, sp. n.

Hind tibiæ of male rather curved downwards and fringed with hair throughout.

Head, thorax, and abdomen white suffused with yellow, the abdomen yellower except at base; palpi red-brown towards tips; fore legs with the femora black-brown above, the tibiæ with black-brown band at extremity. Fore wing golden yellow; a rufous fascia on costa to end of cell, where it expands into a triangular patch to lower angle of cell, a silvery-white fascia below it in and just below the cell; a wedge-shaped silvery-white patch beyond the cell from below costa to vein 2, defined by slight fuscous lines; a curved silvery-white subterminal band from costa to above vein 1, where it is somewhat bifid, defined by fine black lines except at costa; a terminal series of black points and striga in submedian interspace; cilia silvery white. Hind wing silvery white, the inner and terminal areas broadly golden yellow, the white area defined by an oblique sinuous black postmedial line from vein 6 to submedian fold; an obliquely curved silvery-white line from costa before apex to termen at discal fold; four minute ocellate silvery-white spots before termen between vein 5 and submedian fold, the two upper spots with black points on their outer edges, the two lower with black points beyond them, some orange-red on termen

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between the spots and two minute black points above them above vein 5; cilia silvery white with some brown at base beyond the spots.

*Hab.* D'ENTRECASTEAUX IS., Goodenough I. (*Meek*), 2 ♂, 4 ♀ type; BISMARCK ARCH., Rook I. (*Meek*), 2 ♂, 1 ♀. *Exp.* 20-24 mm.

(24b) *Aulacodes nigriplagialis*, sp. n.

*Eristena trigonalis*, ab. 1, Hmps. n., A. M. N. H. (7) xviii. p. 390 (1906).

Hind tibiæ of male slightly fringed with hair above towards extremity.

Head, thorax, and abdomen orange-yellow, the head and tegulæ with some brown mixed; palpi irrorated with dark brown; pectus and ventral surface of abdomen white suffused with orange-yellow, legs orange-yellow, the fore tibiæ with dark brown band at extremity. Fore wing orange-yellow; a very dark red-brown fascia on costa to end of cell, the end of cell below it white; a large conical very dark red-brown patch tinged with blackish from postmedial part of costa to vein 2, defined on inner side by a curved dark line met at vein 2 by another faint curved dark line traversing the patch and with a slight greyish tinge between them, a silvery-white band defining the outer edge of the patch defined on outer side by a fine curved black line; a terminal series of black points, forming a minute spot below apex and striga at submedian interspace; cilia silvery white. Hind wing orange-yellow, the costal area whitish to beyond middle; an oblique black postmedial line between discal and submedian folds; an oblique silvery-white line from costa before apex to termen at discal fold; four small black spots before termen between discal and submedian folds, the two upper spots defined on inner side by silvery white, with a waved black line before them diverging obliquely below the 2nd spot, some orange-red on termen between the spots; cilia silvery white, brown at base beyond the spots.

*Hab.* DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂ type, Kapaur (*Doherty*), 1 ♀. *Exp.* 18 mm.

(24c) *Aulacodes dolichoplagia*, sp. n.

♂. Head white, the frons suffused with golden yellow, the back of head with some brown; thorax silvery white, the shoulders, tips of patagia, and metathorax dark brown; abdomen golden yellow, white at base; antennæ yellow; palpi red-brown, white at base; pectus, legs, and ventral surface of abdomen white, the legs tinged with yellow, the fore femora above and tibiæ at extremities dark brown. Fore wing dark brown; a silvery-white fascia below base of cell conjoined to a patch in end of cell; a large oblique conical silvery-white patch from postmedial part of costa to below vein 3 beyond the cell; a series of white striæ before the narrow orange-yellow terminal band defined on inner side by a black line; a

terminal series of black points; cilia brown at base, silvery white at tips. Hind wing silvery white; a dark brown patch at base; the terminal area golden yellow, expanding on inner area to middle, defined on inner side by a series of dark points from below costa to vein 2 and a striga at vein 1; a series of silvery-white marks before termen from below costa to submedian fold, defined by blackish, the spot below costa round, the others elongate except the small spot below vein 5; minute terminal black spots above and below vein 4 and slight striæ towards apex and between veins 3 and 1; cilia silvery white with some brown at apex and a brown line through them from vein 5 to near tornus.

*Hab.* DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂ type. *Exp.* 24 mm.

[To be continued.]

XLVI.—*Descriptions and Records of Bees.*—LXXV.

By T. D. A. COCKERELL, University of Colorado.

*Xylocopa draconis*, sp. n.

♂.—Length about 25 mm., anterior wings 18.5 mm.

Black, without any metallic tint; thorax thickly covered (except bare space on disc) with reddish-ochreous velvety hair; abdomen not banded. Eyes extremely large, converging above; mandibles bidentate, with a yellow basal patch; tubercle of labrum small; clypeus ivory-colour, more or less brownish, with a pair of black spots, the surface of clypeus closely punctured, but an impunctate median ridge; supraclypeal area almost pallid; ocelli large, far down on front; face and front with red-brown hair, darkest around ocelli; top of head and cheeks with reddish-ochreous hair; anterior femora swollen, without hair below; anterior and middle tibiæ with bright fulvous hair on outer side, reddish on inner, and sooty behind; anterior tarsi similarly coloured, but from middle of basitarsus on there is creamy-white hair on under side posteriorly, beneath the sooty, and on apical part of basitarsus anteriorly and beneath the red is very bright; middle tarsi with reddish-black hair above and behind, but red beneath; hind femora broad, basally keeled beneath, with a pustuliform swelling on the side of the keel; hind tibiæ with a conspicuous apical lobe, much broader than long, on inner side; hind basitarsi with ochreous hair in front, black above and red behind, the

under side presenting a large, bare, shining, elevated, wedge-shaped surface; tegulae black. Wings brown, subtranslucent, apically suffused with rosy-purple; venation very different from that of *X. sinensis*, Smith, the third submarginal cell not conspicuously broadened or bulging apically, and the second much less elongated. Abdomen with sooty hair on first segment, second with fulvous, sooty only along apical margin, the rest with scanty hair except at sides and apex; at sides it is sooty, except anteriorly on segments 3 and 4, where is some fulvous; at apex the hair is long and reddish; beneath, the hind margins of the segments are narrowly bright ferruginous and the hair is fulvous.

Southern China (no other particulars known). In U.S. National Museum.

Resembles *X. appendiculata*, Smith, but the hair is quite differently coloured. There is also a general resemblance to the smaller *X. collaris*.

*Xylocopa punctifrons*, sp. n.

♂.—Length about 21 mm., anterior wings 16 mm.

Clypeus (except lower margin, broadening laterally), transverse supraclypeal mark and lateral face-marks (ending very obtusely halfway up front) ivory-colour; labrum black, with a minute light point; thorax without conspicuous light hair, except at sides, where a broad band of greyish hair extends from the tegulae to the ventral surface. Abdomen with a little pale hair on first segment. Wings dark reddish fuliginous, with strong purple tints; light hair on hind tibiae, and middle and hind tarsi, as in *X. tarsata*, but it is ochreous.

French Congo (Queensland Museum). Received by the Museum from Le Mout of Paris.

Very close to *X. tarsata*, Smith, but considerably larger, with the greater part of clypeus and sides of face densely punctured. The colour of the hair on the legs agrees with that of *X. tarsata*, var. *namutonensis*, Strand, but that form has the size of *tarsata*. It is possible that *X. punctifrons* is the undescribed male of *X. tuberculiceps*, Ritsema, but the legs have much more light hair than in the female of that species, and the localities are far apart.

In the same lot came *X. carinata*, Smith, *Mesotrichia praeusta* (Smith), and *Crocisa excisa*, Friese, from Dimbroko, French W. Africa.

*Centris maroniana*, sp. n.

♂.—Length about 28 mm., anterior wings 22.5 mm.

Robust, black, including the legs, but anterior trochanters and tibiae suffused with chestnut-red. Eyes very large, converging above; ocelli large, practically contiguous, and lateral ones distant from eyes less than half diameter of one; sides of face, supraclypeal area and upper part of clypeus ferruginous; the rest of clypeus and the labrum chrome-yellow; scape short and stout, dark reddish, yellow in front; mandibles elbowed near apex; hair of head clear ferruginous; disc of mesothorax and mammiform elevations of scutellum shining; thorax densely covered with velvety hair, black, with a faint rusty tint dorsally, except anteriorly, where it is rich deep red, the red gradually fading into the black; pleura with dark reddish hair; anterior legs with red hair, black on basitarsi; middle and hind legs with long pure black hair; tegulae ferruginous. Wings dark fuliginous, brilliantly purple, with some shades of green. Abdomen with short velvety hair, which is black except a broad yellowish-white (olivaceous-tinted) band, occupying second segment except base and third except extreme apex.

“Guyane, Maroni” (Queensland Museum; received from Le Moul).

Related to *C. smithiana*, Friese (which I have from F. Smith's collection), but larger, with the hair of the thorax dorsally black except in front. From the character of the ocelli, it possibly flies in the evening or at night. The bee-fauna of Maroni, as shown by the same collection, includes the following:—*Acanthopus splendidus*, Fab., *Aglaë cærulea*, Lep., *Exærete frontalis*, Guér., *Oxæa festiva*, Sm., *Xylocopa barbata*, Fab., *Bombus incarum*, Frankl., *Centris obsoleta*, Lep., *C. americana*, Klug, *Epicharis conica*, Sm., *E. schrottkyi*, Friese, *E. affinis*, Sm., *Ceratina lata*, Spin., *Eulæma dimidiata*, L., *E. fasciata*, Lep., *E. mocsaryi*, Friese, *E. smaragdina mexicana*, Mocs., *Euglossa brullei*, Lep., *Eufriesia pulchra*, Sm., &c.

*Pachymelus mediocinctus*, sp. n.

♂.—Length 18 mm., length of anterior wing 14 mm.

Black, with tarsi dark red; eyes large, slightly converging above; clypeus prominent, but flattened on disc, yellow, with upper and lateral margins and two conspicuous spots black; labrum large, emarginate at apex, yellow, with lateral and inferior margins narrowly black; mandibles

bidentate, the inner tooth short (style of *P. hova*), basal part of mandibles mainly very pale yellowish; scape with a yellow stripe in front. Face, front, and vertex with long black hair, but also white at sides of face and (appressed) on each side of labrum; occiput and cheeks with long white hair; mesothorax shining, but distinctly punctured; scutellum only feebly bigibbous; thorax with black hair, becoming obscurely ochreous along anterior margin of mesothorax, bright ochreous (forming a conspicuous wide band) on metathorax, and pure white in middle of ventral surface. Legs with mainly black hair; anterior tibiae with a band of appressed golden pubescence in front; tegulae black. Wings dilute fuliginous; venation as in *P. microlephas*, but second s.m. narrower. Abdomen closely punctured, basal segment with black hair; apical margin of second segment, and all of next three except base, covered with appressed bright ferruginous pubescence; sixth segment with hair partly red and partly black; apical plate emarginate.

Miarinarivo, Madagascar (Queensl. Museum; from Le Moul).)

Similar to *P. cambouei*, Sauss., but that is a very much larger species, with the scutellum different.

*Hyleoides concinnus* (Fabricius).

Launceston, Tasmania, Feb. 15-16, 1916 (*F. M. Littler*).

Genus new to Tasmania. The female agrees with mainland specimens; but the male, compared with one from Sydney, differs by the wholly black prothorax and the more distinct punctures of second abdominal segment.

*Megachile derelicta*, Cockerell.

♀.—St. Patrick's R., Tasmania, 6.2.14 (*Littler*).

New to Tasmania.

*Mesotrichia bryorum* (Fabricius).

Daru, Papua (Queensland Mus.).

The female has the wings suffused with rosy-purplish, whereas Australian examples usually have them much more green.

*Eulæma amabilis*, sp. n.

♂.—At first sight exactly like *E. bruesi*, Ckll., but differing thus: green of mesothorax more brilliant, extending along the sides to the posterior end, where it is very



bright and broadly margined mesad with blue; scutellum with lateral sulci strongly marked, the general surface of scutellum dark purplish and shining, the lateral margins thickened and shining steel-blue; median smooth ridge of labrum little broadened above; apex of abdomen broadly emarginate, formed as in *E. manni*, Ckll. From *E. manni* it is at once known by the strong keel down middle of clypeus, the dark black-haired first abdominal segment, the blue margins of scutellum, &c. From *E. smaragdina*, Perty, by the black hind tibiae, marked with green posteriorly (with a rather small but distinct tubercle above the spurs), and the entirely black hair of thorax. From *E. auripes*, Gribodo, by the strong clypeal keel, the less prominent lateral keels of labrum, and the hair of legs differently coloured, the fringe on apical part of anterior tarsi ferruginous, while the pubescence on outer face of middle basitarsi is shining creamy-white. It is also distinct from *E. mexicana* and the various related forms described by Friese and others. The mesopleura is dark blue.

Manaos, Brazil (*Miss H. B. Merrill*). U.S. Nat. Museum.

*Mesonychium dugesi*, sp. n.

♂.—Length about 15 mm.

Very robust, black, with the abdomen dark but brilliant blue, the hind margins of the segments more or less green; disc of mesothorax dark purple-blue on each side of the median sulcus; pubescence at first sight appearing wholly black, but it is mixed with ochreous on labrum and lower part of clypeus, and there is a spot of the same on each side of front; on lower part of pleura is a little pale hair, and there is white hair on anterior tibiae posteriorly; second and third antennal joints dark red in front; scutellum rather short, hairy, without conspicuous prominences; third s.m. strongly narrowed above, but not nearly to a point; spur of middle tibia strongly bifid, one division with two or three spines; hind femora broad, with a very large tooth beneath near base; hind tibiae with a polished red area at end; venter of abdomen with a large red area in subapical region. The wings are brownish subhyaline, with a dark apical cloud.

Guanajuato, Mexico (*A. Dugès*). U.S. National Museum.

This has the appearance of the species which Schrottky places in his genus *Cyphomelissa*, but the third submarginal cell is as in *Melissa* or *Mesoplia*. It will easily be known from *Mesonychium insigne* (*Melissa insignis*, Sm.), from Orizaba, by the absence of the bright yellow hair. The

venation and middle spur separate it from *M. cærulescens*, Lep.

*Mesonychium decoratum* (Smith).

Bocas del Toro, Panama, July 6, 1908 (*W. Robinson*).

This agrees with one from F. Smith's collection, obtained by Bates in S. Paulo, Brazil. A form with broader pygidial plate (♀) comes from Rio Mato, Venezuela, October (*Carriker*).

*Mesonychium azureum guatemalense* (Cockerell).

Cacao, Trece Aguas, Guatemala, April 4 (*Barber & Schwarz*).

This specimen shows that the type was partly denuded. The disc of mesothorax and outer face of hind tibiæ are ornamented with green scale-like hairs.

*Mesonychium duckei* (Friesse).

Cabima, Panama, May 17, 1911 (*Aug. Busck*).

The third s.m. is very much broader below than in *M. decoratum*, so that the venation approaches *Cyphomelissa*. After reviewing the subject, I must agree with Ducke that *Mesonychium* is the proper name for this genus, including *Mesoplia* and *Melissa*, and also *Cyphomelissa* as now interpreted by Schrottky.

*Colletes cyanescens*, Haliday.

I have this from Santiago, Chile, and specimens marked Southern Chile (*M. J. Rivera*) are in the U.S. National Museum. *C. atripilis*, Vachal, is a synonym.

*Triepeolus pruinosus*, sp. n.

♀ (type).—Length about 9 mm.

Black, the thorax densely punctured and not shining; basal half of mandibles red; labrum dark reddish; clypeus very minutely and densely punctured; scape red at base and more or less at apex; second and third antennal joints bright ferruginous; a conspicuous patch of creamy-white hair on each side of antennæ; mesothorax with a thin pruinose pubescence, anterior margin with two nearly round spots of yellow pubescence; yellowish-white prothoracic hair-band broadly interrupted in middle, ending laterally in round spot on base of tubercles; tubercles reddish; hind margin of mesothorax with a creamy hair-band; scutellum

moderately bigibbous, axillæ bluntly conical; area of metathorax dull and rough basally; tegulæ bright ferruginous. Wings strongly dusky at apex. Legs obscure ferruginous, spurs red. Abdomen with broad yellow bands on first two segments, that on first anteriorly produced at sides into an evanescent cloud, not a distinct tooth or band-like lobe; third and fourth segments with whitish bands, more or less failing in middle; modified pygidial space subcircular, not very large; last ventral segment produced beyond last dorsal, the very broad end turned downward.

♀.—Similar in appearance, but the legs are mainly black; the anterior tibiæ, middle tibiæ in front, hind tibiæ at base, and the tarsi (the hind ones not wholly) are red; face densely covered with creamy-white hair; mandibles black with a median red band; flagellum black except at base; yellow spots on anterior margin of mesothorax larger, suffusedly elongate posteriorly; abdomen with five yellow bands (successively paler) and one white one, the first two bands more or less suffused with brownish-orange; ventral fringes pale reddish at ends. The dark parts of abdomen are hoary with a fine pale pubescence.

Carcarana, Argentina (*L. Bruner*, 15). U.S. Nat. Museum.

Resembles *Epeolus burmeisteri*, Friese, but considerably larger, with darker legs, and the patch on anterior margin of mesothorax divided into two spots. *Epeolus* (*Doeringiella*) *bizonatus* (Holmbg.), from Bahia Blanca (*Bruner*), is superficially very like *T. pruinatus*, but larger, and easily separated by the extraordinary antennæ.

*Isepeolus vierecki*, Jörgensen.

Bahia Blanca, Argentine (*Bruner*); San Juan, Argentine (*C. S. Reed*).

It is permissible to correct the specific name, printed "*vierecki*" in Jörgensen's work.

*Isepeolus bruneri*, sp. n.

♀.—Length 10 mm.

Black, mandibles obscurely reddish in middle, but otherwise tegument of head and thorax all black; thorax variegated with white hair as in other species, with two conspicuous black spots on scutellum, and others covering axillæ; disc of mesothorax shining, with well-separated punctures; first two abdominal segments ornamented as in *I. cockerelli*, Jörg., except that the inner processes on second segment are longer; third with a pair of large oblique

(quadrate) patches on hind margin, and each side with a large complicated patch of white, presenting a deep sinus anteriorly; fourth segment with a very large and thick mark having two parts, like the letter H; fifth with two large spots, not reaching apical margin; sixth segment with a small outwardly directed basal spine on each side. Face with white hair, partly black on lower part; front and vertex with black hair; a band of white hair in front of ocelli; scape red at base, middle covered with long white hair, the broad apex intense black; flagellum red beneath; third antennal joint unusually short for the genus, not as long as next three combined; tegulæ red. Wings brownish on apical margin, stigma and nervures piceous; second s.m. distinctly narrower above, receiving first r. n. before end. Legs black with the usual white hair-marks, knees red; pleura with black hair.

Carcarana, Argentina (*L. Bruner*).

Allied to *I. cockerelli*, but known by the abdominal pattern, venation, &c.

*Lonchopria alopes*, sp. n.

♂.—Length about 14 mm.

Head, thorax, and legs black, with long and abundant fox-red hair. Abdomen shining olive-green, with the same red hair, except the last two segments, which are black, the penultimate with black hair. Mandibles bidentate, reddish apically; malar space very short; clypeus very smooth and polished, the upper part with two rounded elevations, between which is a depression bearing a tuft of very long red hair; labrum bituberculate; antennæ very long, reaching to metathorax, flagellum bright ferruginous beneath except at base; face very broad; mesothorax shining, with well-separated punctures; area of metathorax smooth, with an obtuse transverse ridge; tegulæ black. Wings dusky, stigma dull ferruginous; third s.m. very oblique; apical segment of abdomen keeled. Maxillary palpi with six subequal joints.

La Paz, Bolivia, Nov. 14, 1898. U.S. National Museum.

A remarkable species, superficially resembling *L. thoracica* (Friese), but with much longer and more abundant hair on abdomen, shorter stigma, quite different mandibles, &c.

According to specimens received from Friese and Jensen-Haarup, it is *L. armata*, Fr., which is the male of *L. chalybæa*, Fr., not *L. ænea*, Fr., as Friese first thought. *L. marginata* (Spin.), described as a *Colletes*, the specific name preoccupied, apparently becomes *L. zonalis* (Reed, 1892).

*Svastra bombylans* (Holmberg).

Bahia Blanca, Argentine (*Bruner*, 2).

*Xenoglossa crawfordi*, Cockerell.

Guanajuato, Mexico (*A. Dugès*).

*Colletes punctipennis*, Cresson.

Brownsville, Texas, 1908 (*Jones & Pratt*).

New to the United States.

*Pseudomelecta californica miranda* (Fox).

Mexico (C. F. Baker collection, 2320).

*Megachile anthracina*, Smith.

Moulmein, I. Burma, Dec. 1910 (*R. L. Woglum*).

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XLVII.—*The Khapra Beetle* (*Trogoderma khapra*, *sp. n.*),  
an Indian Grain-pest. By GILBERT J. ARROW.

(Published by permission of the Trustees of the British Museum.)

THIS very destructive wheat-pest has been studied in great detail by Messrs. J. H. Barnes and A. J. Grove, who have published figures and descriptions of it in all its stages in Mem. Dept. Agric. India (Chemical Series), iv. 6, 1916, p. 172) under the name *Attagenus undulatus*, Motsch. As already stated in a footnote in the 'Review of Applied Entomology,' v. 1917, p. 126, the insect is really a species of *Trogoderma* and appears to be without a specific name. *Attagenus undulatus* is quite a different insect, as I have established from specimens in the British Museum received from Motschulsky himself (see Ann. & Mag. Nat. Hist. (8) xv. 1915, p. 426). Mr. Bainbrigge Fletcher has incorrectly reported me (Agric. Research Inst. Pusa, Bull. 59, p. 14) as saying that the insect common in stored wheat in Northern India should be known by this name. On the contrary, the distribution I recorded shows *A. undulatus* to belong to tropical and not wheat-growing latitudes.

Specimens found in imported wheat have been received at the British Museum during many years past, and I have

regarded them as probably identical with *Trogoderma versicolor*, Creutz., but they have invariably been in such bad condition that exact determination was impracticable. Under the name of "Kapura" specimens were sent to the Museum by the late E. T. Atkinson in 1888 and stated to be destructive to wheat in godowns at Delhi. Recently I have been able to examine perfect examples, bred in the greatest abundance from samples of Karachi wheat collected by Mr. J. H. Durrant, and the study of these has convinced me that the species is neither *T. versicolor*, Creutz., nor *T. inclusum*, Lec., the figures and descriptions of which show them to be larger and darker coloured, with different antennæ, and possibly not distinct one from the other. It is, therefore, necessary to give a new name to this exceedingly serious pest, and I propose to adopt the vernacular name by which, according to Messrs. Barnes and Grove, it is known to Indian grain-dealers. It may be briefly diagnosed as follows :—

*Trogoderma khapra*, sp. n.

Rufo-ferruginea, capite, pronoto corporeque subtus obscurioribus, antennis pedibusque rufis, elytris vago fusco-bifasciatis; ovalis, nitida, corpore subtus æqualiter, supra longius et magis irregulariter griseo-pubescenti; antennis 11-articulatis, articulis 3-7 minutis, 8-11 sat magnis, clavam formantibus, fœminæ ovatam, multo compactam, maris longiorem, apice producto et compresso. Long. 1.75-3 mm.

Although I have seen an enormous number of specimens, the largest scarcely exceeds 3 mm. in length, with the head fully extended, and this is considerably less than the size indicated for the European and N.-American types of Creutzer and Leconte. The elytra are of a rather light red-brown shade, generally marked with two vaguely defined darker transverse bands, and the head and pronotum are nearly always distinctly darker than the elytra, but rarely black. The surface is clothed with grey hairs, which are very easily rubbed off, and the worn specimens found amongst the grain are very smooth and shining. Upon the darker areas of the elytra the hairs are finer and scantier. The antennæ and legs are entirely light in colour.

The males are much smaller on the average than the females and have rather longer antennæ, the joints composing the club, and especially the terminal one, being more elongate.

This insect is found in enormous profusion in cargoes of wheat from Karachi and Bombay; but there is no evidence that it is able to perpetuate itself in Europe, nor has it been found in grain imported from other regions than India.

## PROCEEDINGS OF LEARNED SOCIETIES.

## GEOLOGICAL SOCIETY.

February 28th, 1917.—Dr. Alfred Harker, F.R.S., President,  
in the Chair.

The following communication was read:—

‘Fourth Note on the Piltdown Gravel, with Evidence of a Second Skull of *Eoanthropus dawsoni*.’ By Arthur Smith Woodward, LL.D., F.R.S., V.P.G.S. With an Appendix on the Form of the Frontal Pole of an Endocranial Cast of *Eoanthropus dawsoni*. By Prof. Grafton Elliot Smith, M.A., M.D., F.R.S.

Excavations last summer round the margin of the gravel-pit at Piltdown (Sussex) supported the conclusion that the deposit is a varied shingle-bank, and that the three layers containing Palæolithic remains and derived Pliocene fossils are approximately of the same age. Many elongated flints and pieces of Wealden sandstone were observed in the bottom sandy clay with their long axis more or less nearly vertical. No teeth or bones were found, but one nodular flint obtained from the same layer as *Eoanthropus*, seems to have been used by man as a hammer-stone. This is not purposely shaped, but merely battered along faces that happened to be useful when the stone was conveniently held in the hand.

In the winter of 1915 the late Mr. Charles Dawson discovered in a ploughed field, about a mile distant from the original spot, the inner supraorbital part of a frontal bone, the middle of an occipital bone, and a left lower first molar tooth, all evidently human. These are rolled fragments, and the first and third may be referred with certainty to *Eoanthropus dawsoni*; but it is doubtful whether they represent more than one individual. In mineralized condition they agree with the remains of the type-specimen. The piece of frontal bone exhibits the characteristic texture and thickness, with only a very slight supraciliary ridge, and a small development of air-sinuses. The occipital bone is somewhat less thickened than that of the original specimen of *Eoanthropus*, and bears the impression of a less unsymmetrical brain. The external occipital protuberance is a little above the upper limit of the cerebellum, as in Neanderthal man; thus differing from the condition both in *Eoanthropus* and in modern man. The lower molar is exactly similar to the first lower molar of *Eoanthropus* already described, but is more obliquely worn by mastication. Detailed comparison shows that this tooth is human, differing essentially from that of a chimpanzee in its more hypsodont crown, thicker enamel, and less prominence of the neck over the root. The occurrence of the same type of frontal bone with the same type of lower molar in two distinct localities, adds to the probability of their belonging to one and the same species. With these remains were found brown flints in great abundance, and one rolled portion of a lower molar tooth of *Rhinoceros* in the same highly-mineralized condition as the derived Pliocene teeth at Piltdown.

In an Appendix, Prof. G. Elliot Smith expresses the opinion that the endocranial cast of the fragment of frontal bone presents features more primitive and more ape-like than those of any other known member of the human family.

## MISCELLANEOUS.

[We have received from the Secretary to the International Commission on Zoological Nomenclature a circular letter giving 39 generic names in Protozoa, Coelenterata, Trematoda, Cestoda, Cirripedia, Tunicata, and Pisces, chiefly Linnæan, which have been proposed for inclusion in the Official List of Zoological Names. Owing to its length we are unable to publish the list in full, but a copy will be sent to any person sufficiently interested on application to the Secretary to the International Commission on Zoological Nomenclature, Smithsonian Institution, United States National Museum, Washington, D.C., U.S.A.]

*Notice to the Zoological Profession of a Possible Suspension of the International Rules of Zoological Nomenclature in the Cases of Musca, Linnæus, 1758, and Calliphora, Desvoidy, 1830.*

IN accordance with the Rules of the International Zoological Congress, the attention of the zoological profession is invited to the fact that Dr. L. O. Howard, W. Dwight Pierce, and twenty-one other professional zoologists have requested the International Commission on Zoological Nomenclature to exercise its plenary power in the case of the Linnæan genus *Musca*, 1758, and, under suspension of the Rules, to declare *M. domestica* as type of this genus, also, under suspension of the Rules, to validate *Calliphora*, Desvoidy, 1830, with *C. vomitoria* as type.

The request is based on the grounds of practical utility, and an almost unbroken history of consistent usage since 1758 in the case of *Musca*, and since 1830 in the case of *Calliphora*. It is claimed that a strict application of the Rules will produce greater confusion than uniformity.

According to the premises at present before the Commission, if the Rules are strictly applied, the generic name of *Musca* would take either *M. caesar* or *M. vomitoria* as type, and the species *M. domestica* would be cited either in *Conostoma*, 1801[?] (type *Ascaris conostoma*=larva of *M. domestica*), or in *Conosoma*, 1802 (type *Ascaris conosoma*=larva of *M. domestica*), or in *Promusca*, 1915 (type *M. domestica*), thus resulting in a very regrettable change in the nomenclature of the species in question as almost universally used in entomological, zoological, medical, epidemiological, and veterinary literature.

The Secretary of the Commission invites any person interested in these cases of nomenclature to communicate his opinion on the subject as soon as possible, and not later than May 1, 1918, when the subject will be submitted to the Commission for vote.

C. W. STILES,

*Secretary to Commission.*  
25th & E. Streets, N.W.,  
Washington, D.C.



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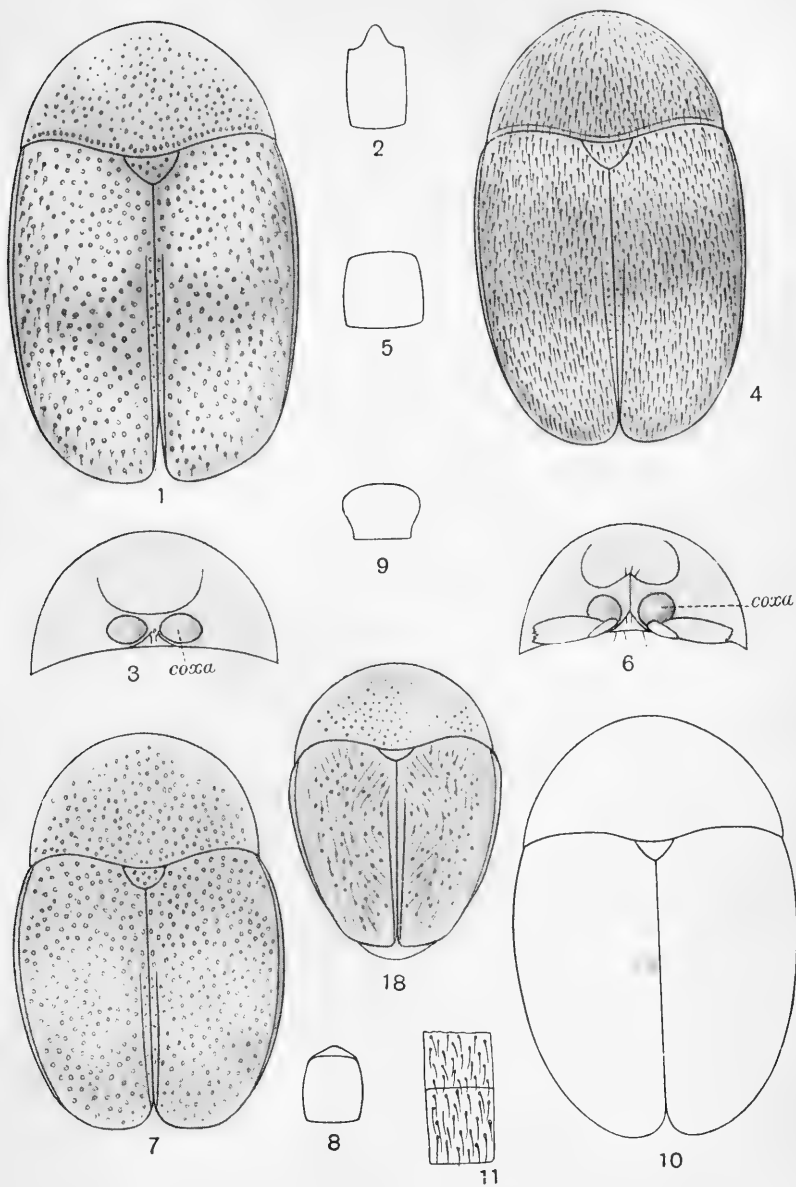
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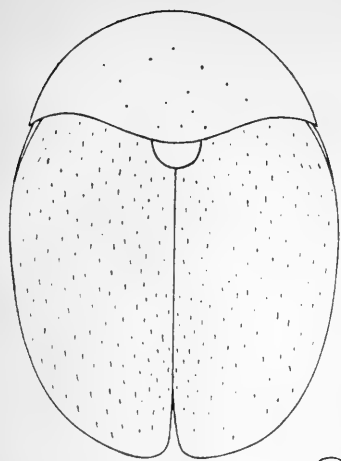


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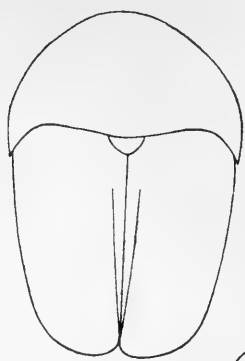
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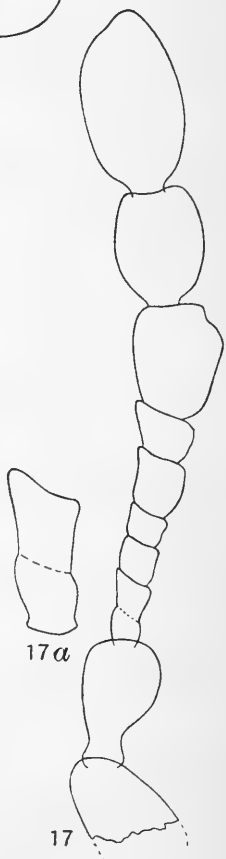
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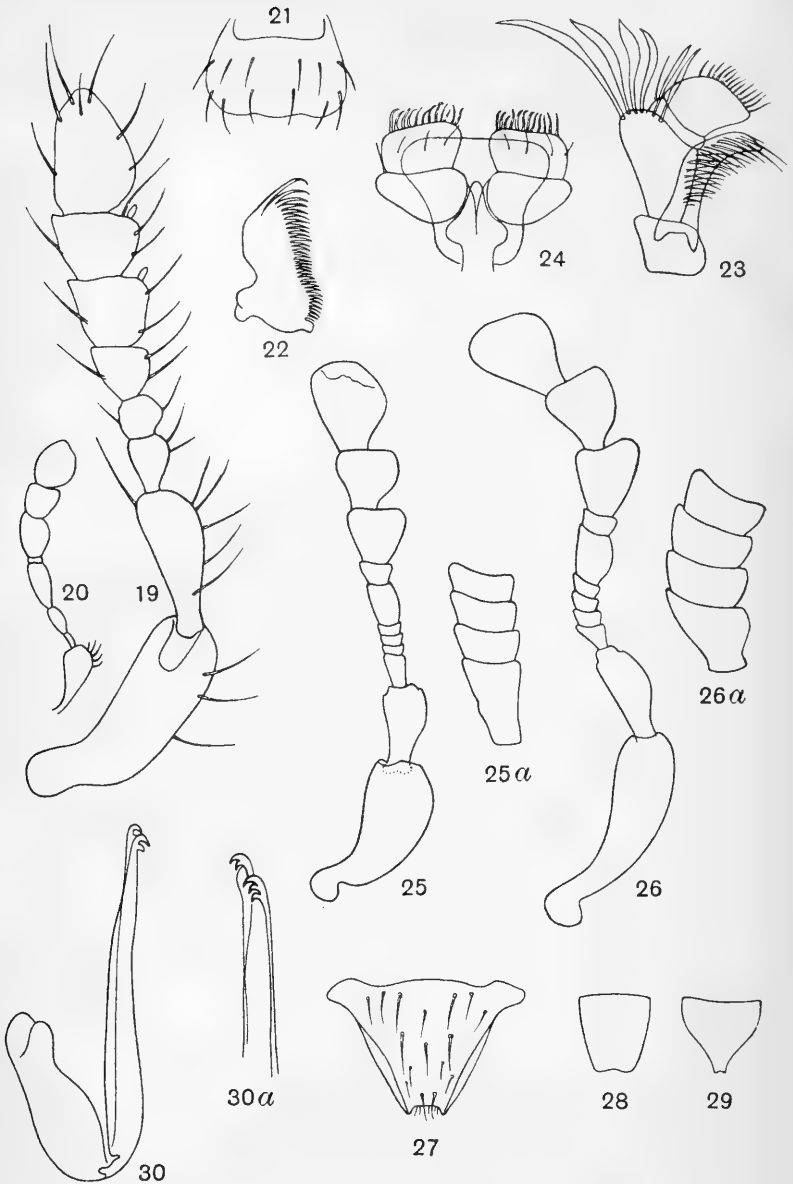
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CORYLOPHID BEETLES.





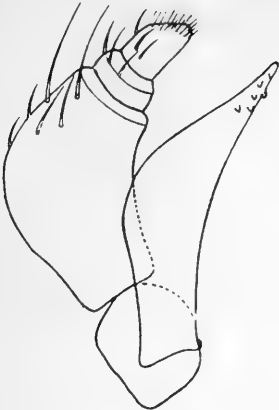


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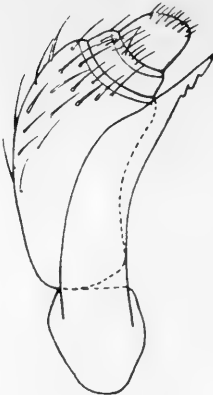
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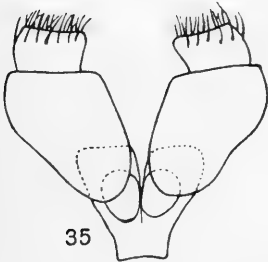
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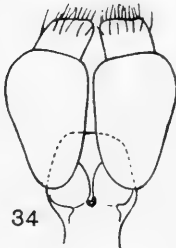
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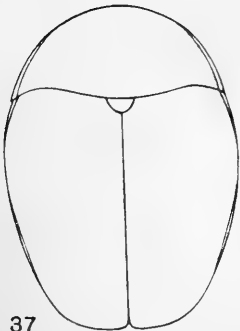
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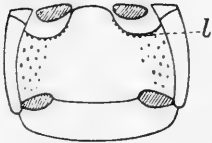


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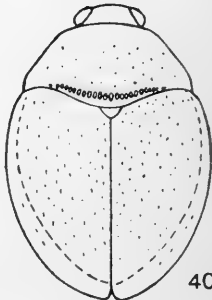


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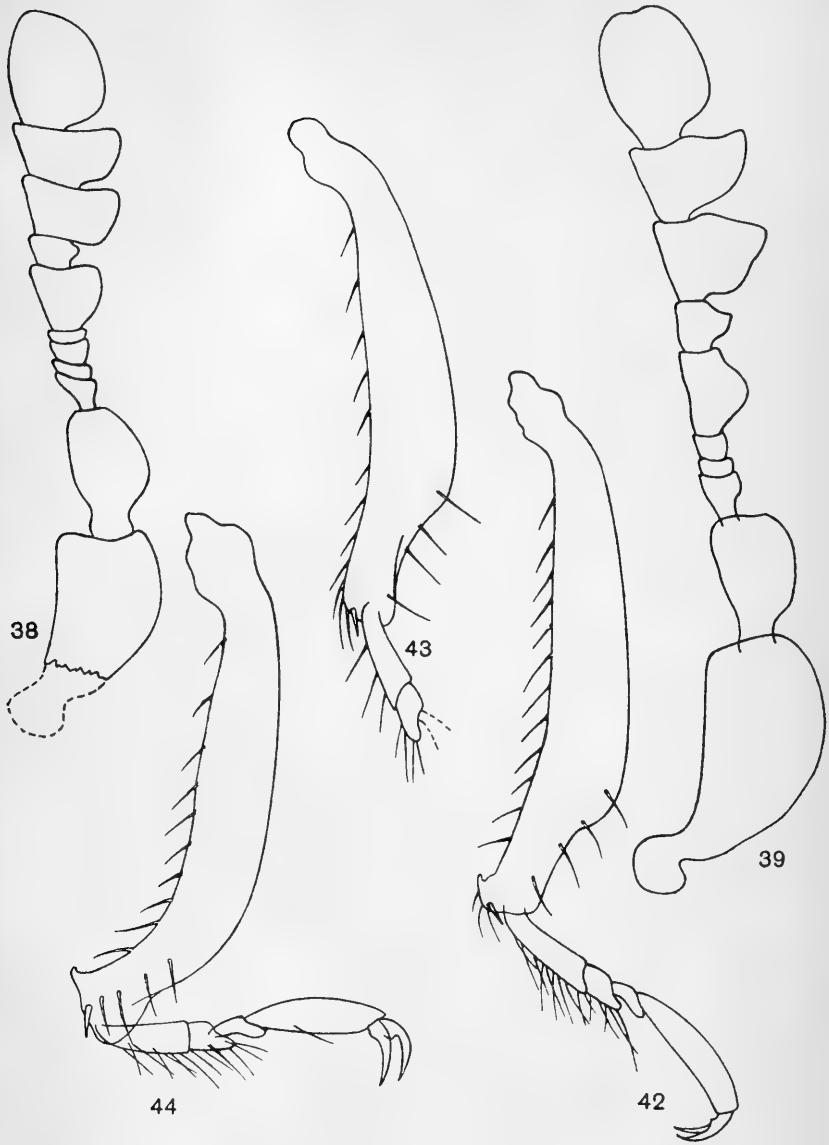


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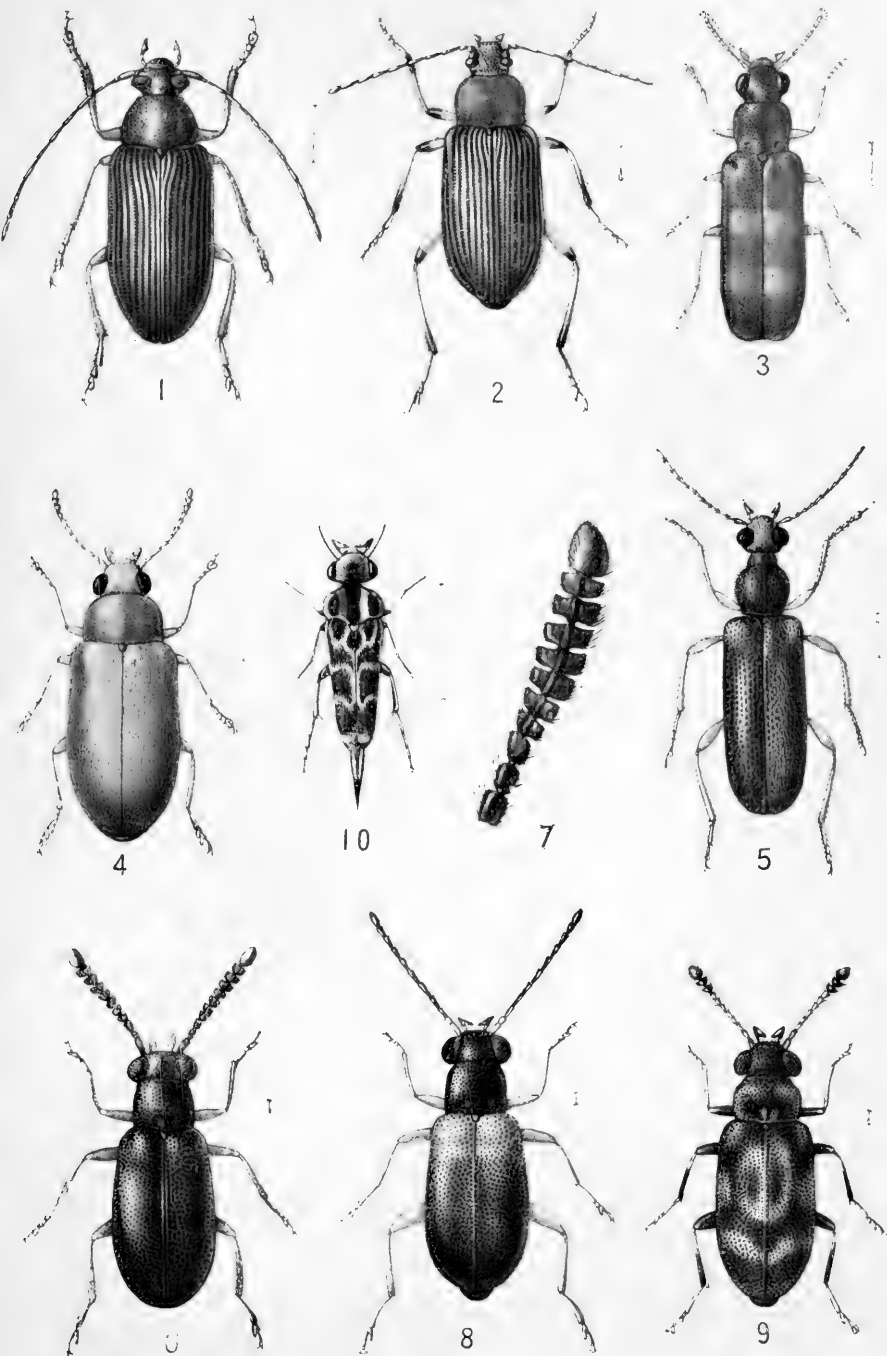
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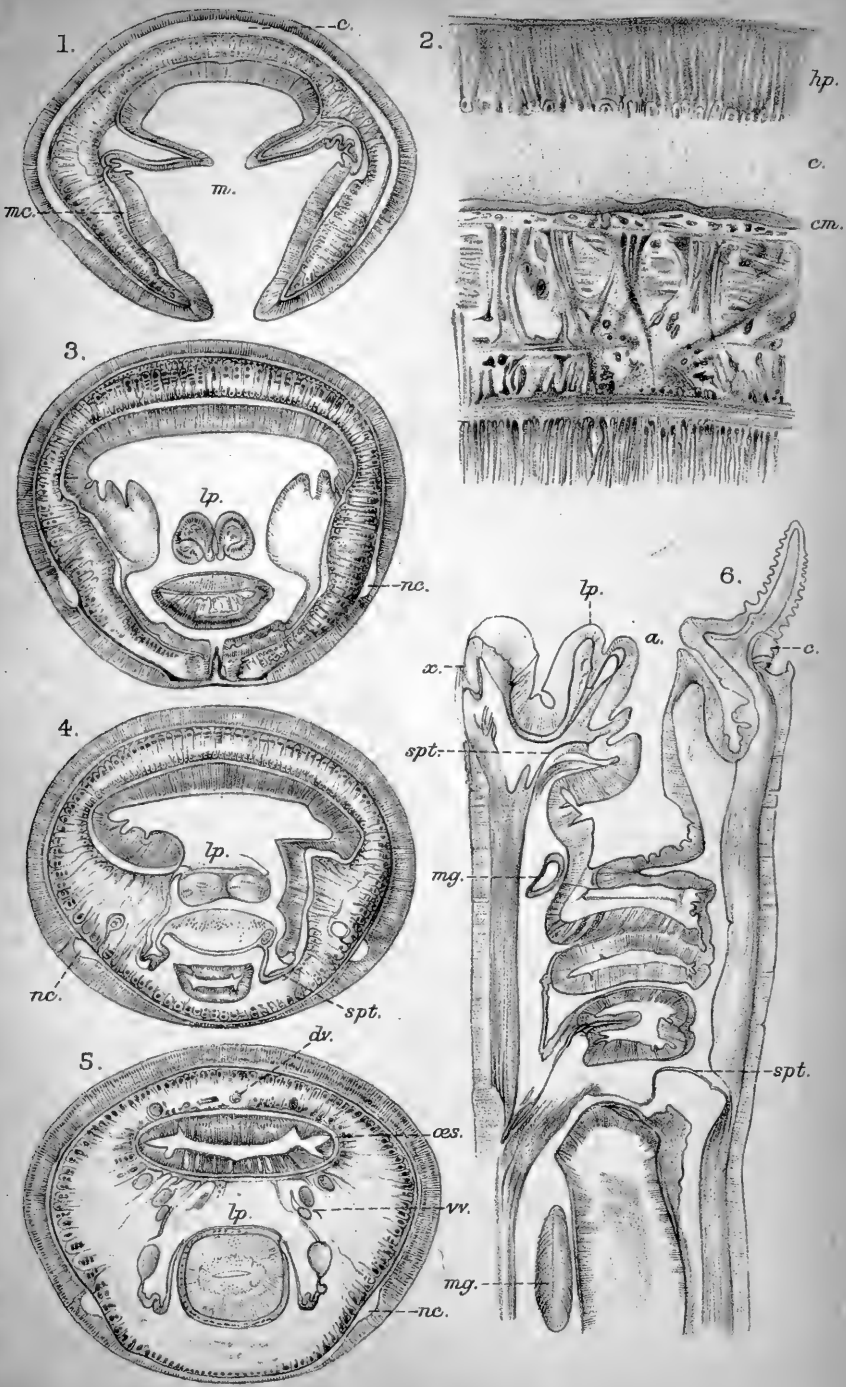




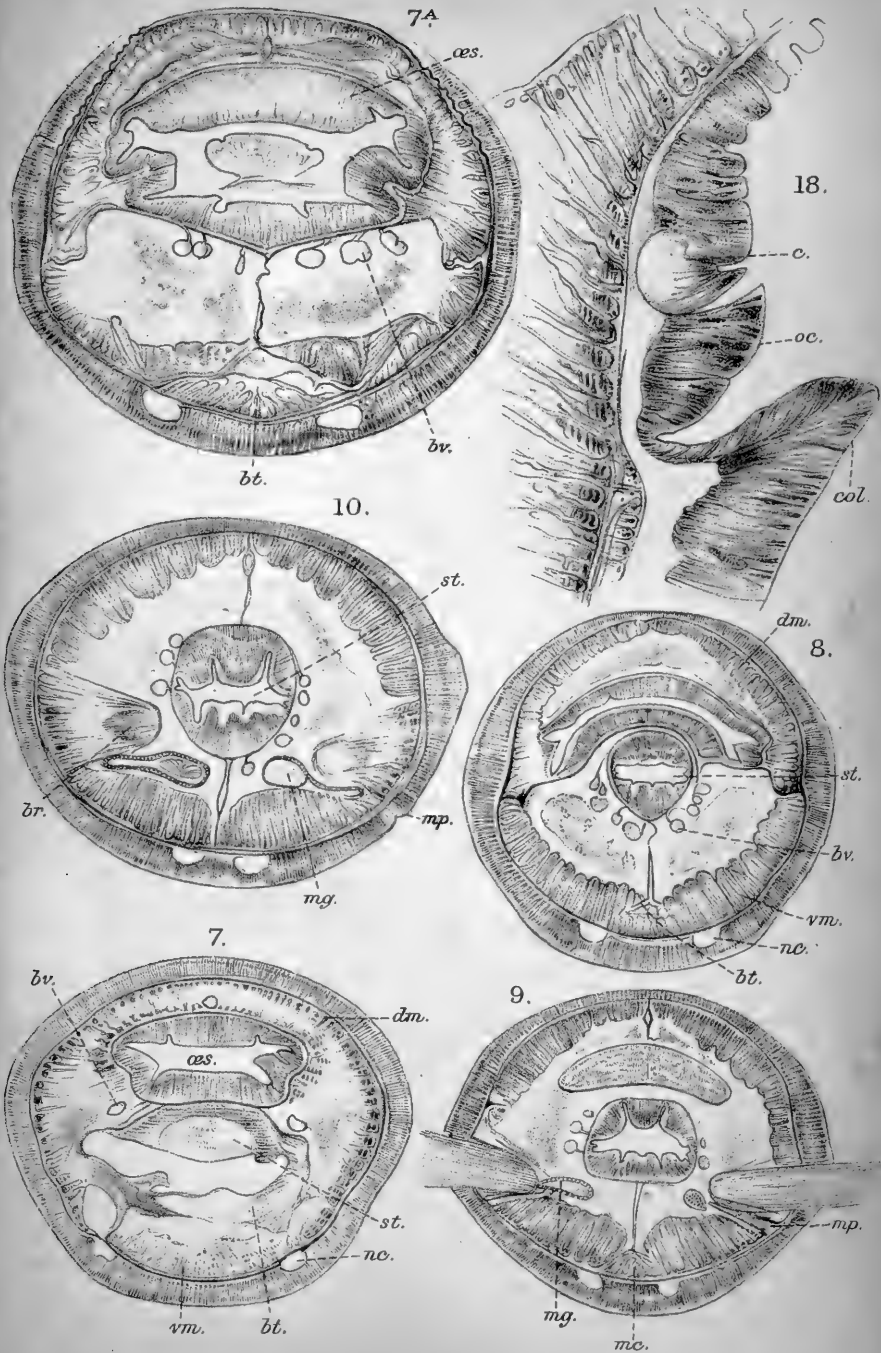
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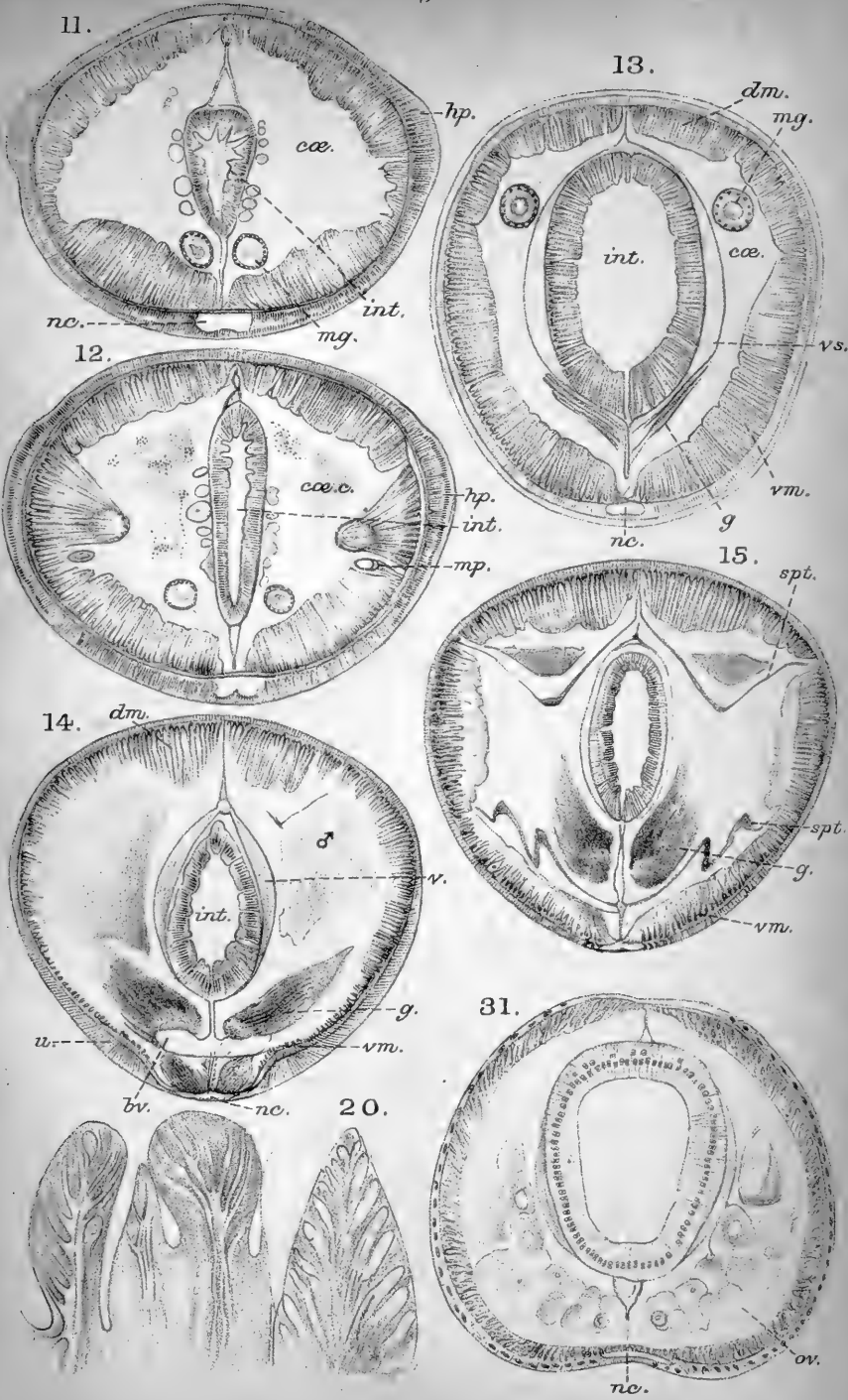






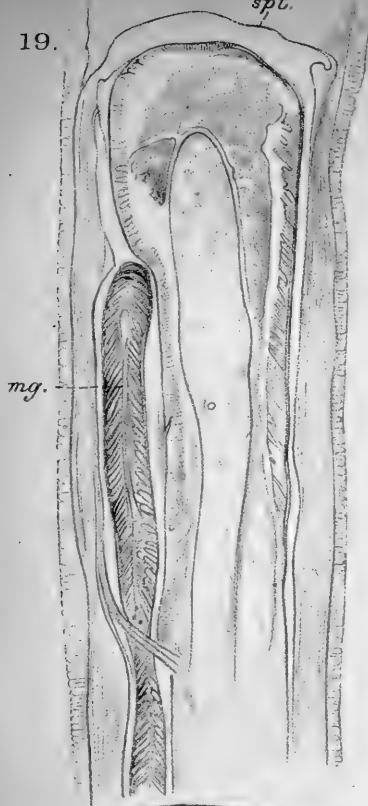




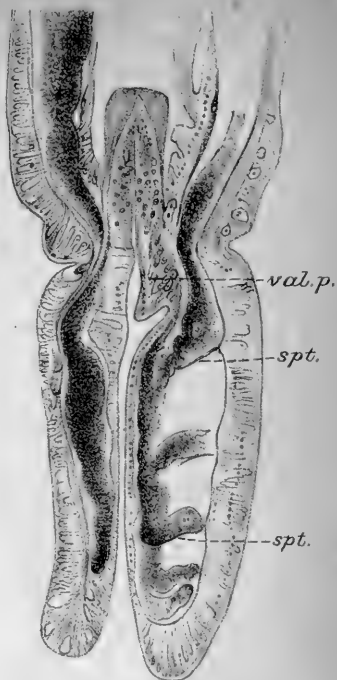




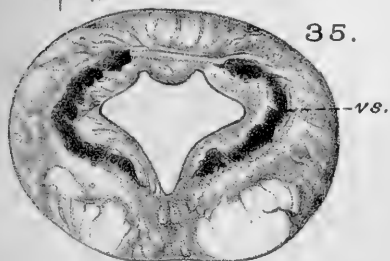
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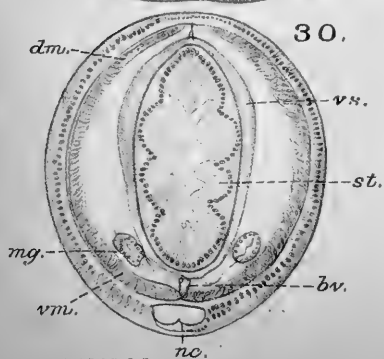
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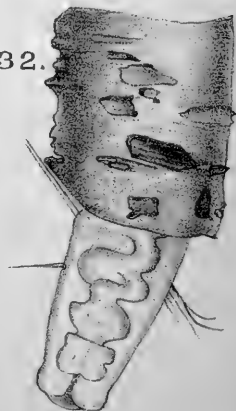
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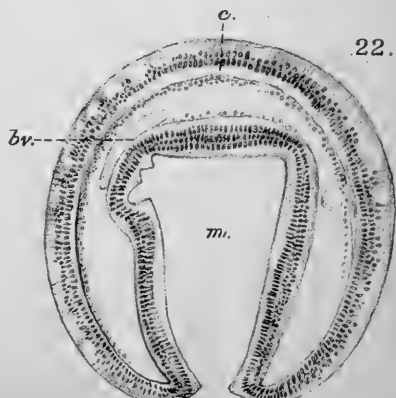
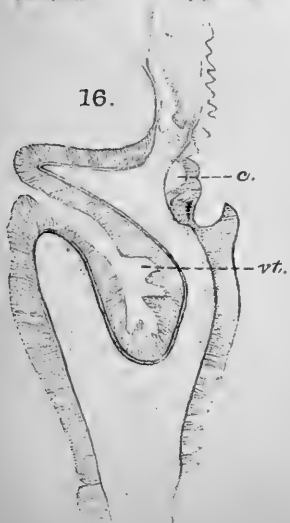
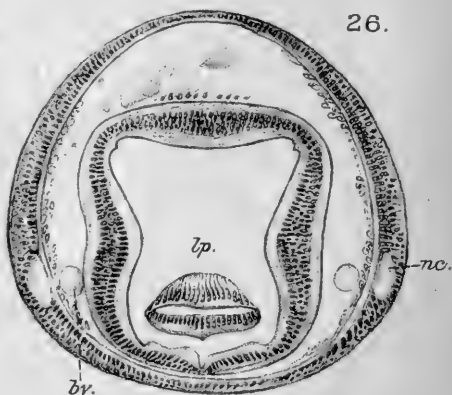
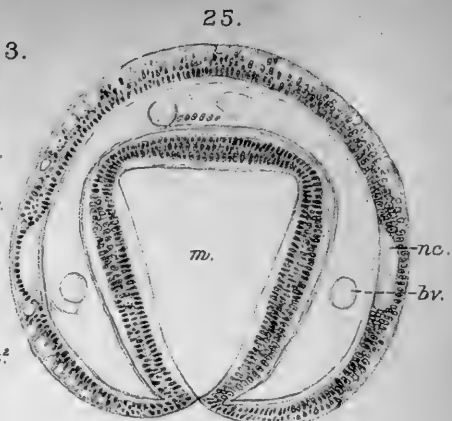
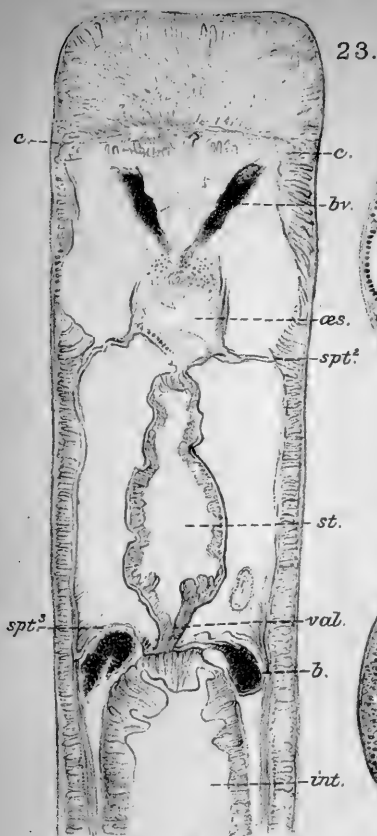


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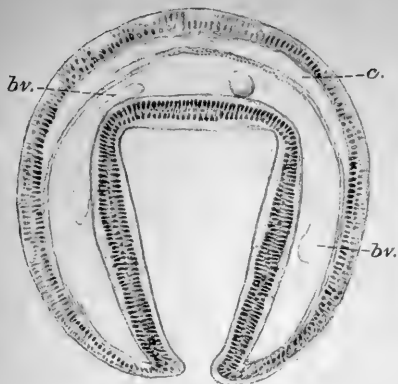




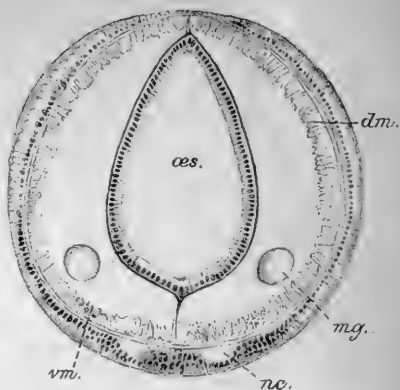




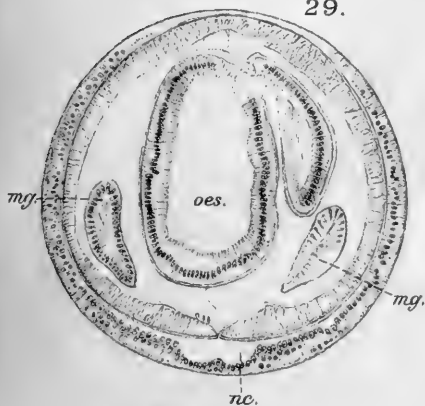
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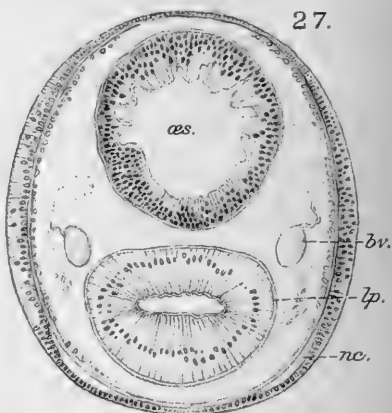
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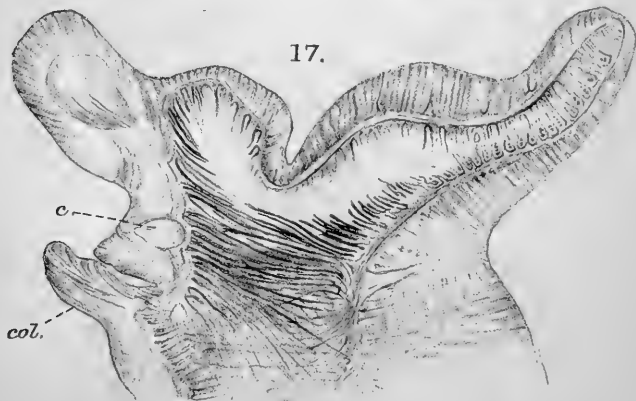
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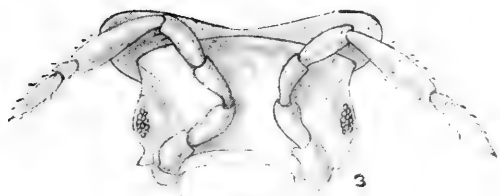
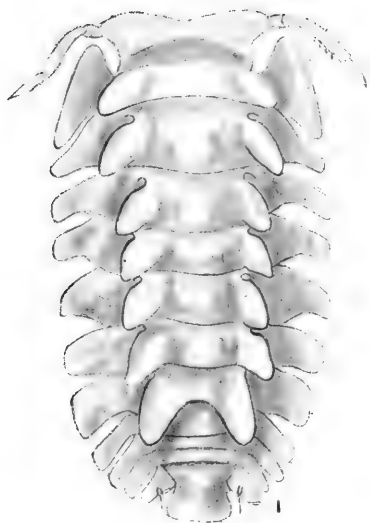
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